

Foreign Body in the vitreous, which has become loosened from its position on the retina and is suspended by a connective tissue band in the vitreous.

Fig. 16.

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TRANSACTIONS

OF THE

Ophthalmological Division

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American Academy of
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Oto-Laryngology,

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EDUCATION FOR OPHTHALMIC PRACTICE.*

BY EDWARD JACKSON, M.D.

DENVER.

WHEN forty years ago a few men met in New York to form the American Ophthalmological Society, the oldest of the American special societies, there were probably not two score physicians in America who "devoted themselves chiefly to the practice of diseases affecting the eye, ear, nose or throat." To-day there are more than two thousand within the borders of our country who are for that reason eligible to membership in this Academy, and who need a connection with such an organization. The specialist requires a special literature, he requires special societies, and primarily he requires a special education. So long as special training was needed by only a few scattered individuals, the means by which it might be obtained were of importance only to those individuals. But now that this special training is required by a large and rapidly increasing body of physicians, the institutions that furnish medical education must take upon themselves the task of meeting the demands of the time.

Among the most important problems regarding medical education that will demand early solution are those that cluster around specialization in practice. If, in the future, our profession is to be a group of closely associated specialists, the institutions which train men and women for its work must train them for special practice. As the most definite and most developed specialty that has grown up within the medical profession, ophthalmology probably shows in the clearest light yet obtainable, the needs and difficulties of such training, and on this account the discussion of education for ophthalmic practice has a broad general interest.

The advances in medical education during the past generation have all been in the direction of increasing its amount,

either by lengthening the course of study, by raising the standard of requirements for admission to the medical schools, or by rendering the effort expended in medical instruction more effective by improved methods, such as laboratory demonstrations, and ward classes. But the accumulation of new facts, the opening up of new fields of scientific investigation, the increase of resources, applicable to the relief of human suffering, goes on with ever increasing rapidity. The new facts of value and importance in their medical applications, that each year brings to light within the broad domain of science, are beyond the power of any one human mind to master in a year's study. Specialization is then inevitable. Shall it be the specialization of disintegration or the specialization of organic development? Shall the medical profession be replaced by unrelated groups of narrow workers, ignorant of what is being done by the workers of other groups, having little contact with each other, and no broad scientific interest even in the problems which center around their own special work? Or shall we still have a great medical profession, its members capable of thinking beyond the daily routine, interested to trace relations in all fields of science, trained for full co-operation with all whose work it is to relieve suffering and conserve life? Which shall it be? The question must be answered by the medical education of the near future.

It was a misfortune that dentistry developed so much outside of the recognized lines of the medical profession. Perhaps it is our greatest debt to Helmholtz, and Graefe, and Donders, that ophthalmology grew up within those lines. In spite of the work of these great men and that of their students, there are influences at work that tend toward the loosening of the bands which hold us in the medical profession. Most potent and dangerous among the influences are the failure of the medical school to give the specific technical training required for ophthalmic practice, and its failure to utilize certain branches of ophthalmology in the training of all medical students.

The training for a certain line of work must be judged first by the efficiency it confers for that particular work. Breadth of training, information and thought upon collateral

lines are excellent, they are highly desirable, they are the things that I would argue for; but in preparing for a certain line of life work, the essential is training in that special work. Is there not something grotesque in the claim that the fitting of glasses should be done only by the medical profession, if the average graduate in medicine is sent out ignorant of the methods of measuring refraction, or with only the most superficial and perfunctory knowledge of the subject?

Remembering that a specialty exists because of what is special or peculiar to it, what is the special work constituting ophthalmic practice for which the practical ophthalmologist is to be trained? First, it deals with mathematical problems of refraction and ocular movements. Second, it includes particularly delicate and exact manipulations and operations. Third, it takes up the problems connected with a very special anatomy, physiology, pathology, therapeutics and hygiene. From these it extends so far as the individual practitioner may choose to go into the usual domain of general medicine and surgery.

It must be remembered that the correction of errors of refraction is something absolutely different from the usual measures of medical and surgical therapeutics. Success in this department depends not upon fortunate guessing, or the recollection of similar cases encountered in a wide experience; it depends upon a minute painstaking accuracy to furnish the data, from which a proper appreciation of physiologic relations can build the best formula for lenses. What has there been in the medical training of the past, what is there in the medical curriculum of to-day to train the student to painstaking accuracy in mathematical measurements? Until he is so trained he is unfitted for the common, every-day work of ophthalmic practice. Not merely unfitted for dealing with rare conditions, the difficult cases, but unfitted to treat the first case that is likely to enter his office. Training in mathematics and mathematical measurements is the first step toward fitting the student for modern ophthalmic practice.

Next consider the need for education of hand and eye for the delicate manipulations properly expected of the ophthal-

mic surgeon. What is there in the usual medical course to cultivate the student's ability in this direction? True, he can spend time in a specially minute and delicate dissection. But how many medical schools require it? How much account will be taken of it in his final examinations? A medical course that merely permits the student to do this kind of work, is but one remove from a course that would permit him to gain all his medical knowledge and skill outside its requirements. There is nothing taught in medical colleges that cannot be studied outside. The plea that the medical course does not prevent the student from getting for himself the training required for ophthalmic practice, is practically an abandonment of ophthalmology to outside opportunities and outside instruction. But the present status of the medical course in this respect is not quite so innocent as this plea would make it. As a matter of fact the course is crowded with other things. The student's time and energy are so engaged by it that it renders other than its required training largely impossible. Then, too, the accurate eye and the delicate touch are things that must be acquired early in life. Year by year special excellence in these directions becomes less and less possible.

But perhaps the most glaring defect of the present medical course as a means of furnishing education for ophthalmic practice, is the lack of work in special anatomy and physiology. Anatomy and physiology are the foundations of scientific medicine. But the anatomy and physiology that have this relation to ophthalmic practice are the anatomy and physiology of the eye and related organs. It is of just as much importance for the ophthalmologist to have the training in this special anatomy and physiology early in his medical course, as it is for the general surgeon to be familiar with the anatomy of the bones and the joints before he takes up the study of fractures and dislocations. True, again, if the medical curriculum fails to occupy his whole time and so crowd the student that work outside of its lines will be impossible, he may take up this study of ocular anatomy and physiology as a sort of voluntary outside pursuit. But from those who attempt to determine his fitness for practice, he will not receive the same credit for knowing the depth of the

anterior chamber where he is to make the cataract incision, as he would for remembering the location of the vermiform appendix or the anatomy of the ankle joint, for which knowledge he will in ophthalmic practice have no use whatever.

If you have followed my line of thought you have already noted that it gives a direct challenge to the old orthodox view of the training of a specialist, viz.: Teach the student how to cut off a leg, prescribe a compatible mixture, or manage successfully a case of labor—and leave him in ignorance of that vast accumulation of knowledge, and unskilled in those extremely delicate manipulations and precise methods, upon the accuracy of which his ability to serve the community as an ophthalmologist will chiefly depend. The plan of carrying a student through his college course in entire disregard of the line of work that he is to take up afterward, lacks any sound basis in psychology, and it is condemned by its results. Graefe entered upon the study of medicine that he might become an ophthalmic surgeon. All the knowledge and experience, all the manipulative and diagnostic skill that he gathered were arranged with reference to this purpose. From the first, each item took place and relations from its bearing upon ophthalmic practice. If I read his career aright, it was this fact far more than peculiar natural abilities and good opportunities, that made him the pre-eminent, practical ophthalmic surgeon among the founders of modern ophthalmology.

The hands, brain, intellect, of the individual develop but once; they reach the highest efficiency only when that development is continuous and intelligently directed from the start. All unrelated information is an incubus; every accomplishment that brings no added ability by change of activity or broadened view, is a dissipation; and the spending of a large part of the four years of a medical course in loading up with useless detail of fact, and the acquiring of highly specialized ability to do what will never be done, is a criminal waste of vital energy when every bit of vital energy is needed. Either the medical course must be reorganized to give what the developing specialist needs, or the specialist will cease to take it. Let me protest that this is not a plea for a narrow specialism. It is the advocacy of a real special-

ism, so stripped of what is useless and hindering as to render possible the attainment of the broadest development of which the human mind is capable.

The work of readjusting the general scheme of medical education to the essential fact of specialism, must be one of revision, selection and rearrangement, not simply a matter of addition. The plan of raising the standard of medical education by adding now and again a year to the length of the course, has gone to the limit. We know how many years the average healthy individual can expect to spend in active life; we know how many years intelligence, nerve centers and muscles remain plastic, and best fitted to acquire new thoughts, co-ordinations and movements; we know at what age the best results in character demand that the young being should be thrown upon his own responsibility, left free to make his own choice and to self-support. These periods will not be greatly altered in a thousand years, however great the rush of discovery and the broadening of the field of human endeavor. The readjustment of the medical course cannot be a matter of infinite extension; it is a matter of wise selection.

From the standpoint of ophthalmic practice in the opening years of the twentieth century, what are the selections that will give the student, for the time and effort he expends, the highest efficiency in his chosen line of work? What will give this with the smallest amount of unprofitable acquirement, that he may be left with time, energy and intellectual appetite to follow to the furthest limit every line of thought that seems to him naturally related to his work? Yet which will give him the breadth of interest and sympathy, the all-around mental development, which will fit him to see his work in its broadest relations?

In the end, a curriculum will be settled by experience, and is likely always to remain full of tradition and compromise. But it is worth while to guide ourselves, in these gropings toward something better, by the clearest statement we can frame of what seems at this time an ideal to be aimed at. Of the studies that now form the frame-work of the medical course, none can be wholly dispensed with. Possibly obstetrics in its narrower limitations might be cut out altogether;

but certainly the outline of intra-uterine development, and some knowledge of the general conditions that mark pregnancy and the puerperal state, must be retained. The process of selection is not so simple as the selection of certain branches. It must go into every part of every branch of medical teaching, weigh the individual facts, and even choose the point of view and avenues for their approach.

In anatomy, the point of view has been too much that of the general surgeon. The specialist of internal medicine has suffered from this as much as the ophthalmologist. As the general surgeon would resent being required to learn and remember that minute anatomy of the retinal vessels which is needed for the understanding of a case of partial retinal embolism, so the ophthalmic surgeon has a right to protest against having his memory burdened with the land-marks by which the iliac artery might be located for ligature, or the position of the sciatic nerve determined for the injection of a local anæsthetic. If it is impractical to drill the general surgeon in all the minute anatomy that the ophthalmologist should know, it is equally impracticable to begin the preparation for ophthalmic practice by loading up with the anatomical equipment of a general surgeon.

The anatomy which the ophthalmic surgeon should know must include that of the eyeball and its appendages, the orbit and neighboring cavities, the visual tract and whatever intersects or comes in relation with it. These he must know with greatest accuracy and in minute detail. But to this knowledge must be added such a general acquaintance with the anatomy of other portions of the body as would enable him to understand the physiology and pathology of the different organs and to appreciate any general principle of anatomical construction and support. Thus an acquaintance with the hip and shoulder joints will give a broader appreciation of the principles of the ball and socket movement which takes place in the case of the eyeball. While such things as the anatomical and surgical necks, the great trochanter, or the greater tuberosity of the humerus, have little more bearing on general anatomical principles than they have upon ophthalmic operations.

Physiology is so closely connected with general pathology

—faults of nutrition in any part of the body are so often related to diseases in the eyes that its general principles should be as thoroughly taught to all who practice ophthalmology as to those who practice any branch of the healing art. Still there is much of detail, of surmise, of experiment not yet sufficiently connected with normal life processes, to make it possible to exclude a great deal that finds place in the physiological text-books, when it comes to selecting that which he can properly be expected to remember. The nervous, muscular and vascular systems are so extensively represented in the eye, and play such important parts in its normal and physiological life that nothing related to their general physiology should be neglected. Then there is the large mass of special physiology, such as ocular movements and the optical properties and actions of the eye, which must be mastered and assimilated before the education of the ophthalmologist can profitably go on to other branches. Shorn of all that can be dispensed with, physiology has for the ophthalmologist, as for the physician or general surgeon, an overshadowing importance.

General pathology—the physiology of disease—is of similar importance. Nearly all the general morbid processes are represented in the diseases of the eye. There is as much need for the familiarity with them here as in any branch of medical practice. Indeed so much more certain and definite is the pathology of the eye in some respects, as in renal retinitis, that more exact and definite knowledge of the changes he has to deal with, can properly be expected of the ophthalmologist than of the specialist of internal medicine, or of the general surgeon, who may be compelled to use his scalpel as an instrument of diagnosis.

The things that can be excluded from the training required in pathology will be chiefly the descriptions and examinations of special appearances presented in distant organs, and the special pathology of organs not closely related to the eye. As to the vast science of bacteriology, it is still uncertain to what extent such recently acquired knowledge can be rendered available for the instruction of the student. But that this subject touches ophthalmology as closely as any other branch of medicine, has already been proven; and

a general acquaintance with it will certainly be more directly applicable to practice, and do more to broaden the student's intellectual horizon, than will instruction in many of the details which have in former years been given an important place in the medical curriculum.

The teaching of therapeutics offers some of the most difficult problems that are to be encountered in connection with the subject of medical education. On the one hand the physician has been swamped by the energy, cupidity, plausibility, and falsehoods of the promoter of new drugs. On the other hand, therapeutics is preëminently the study for a life time. If there be general principles discernable in this branch of medical science, they are of highest importance to the ophthalmologist. If there be exact and comprehensive knowledge of the action of any drug upon tissues represented in the eye or its appendages, as all the general tissues are, that knowledge should be completely at his command. The therapeutic influences aside from drugs, at our disposal, demand equal attention. The eye has a situation peculiarly favorable for their efficient employment.

The special therapeutics of ophthalmology have grown to large proportions. This is illustrated by the recent interesting, but fragmentary, work of Darier. To gain time for what is most worth knowing in the first year of ophthalmic practice, something can be gained by cutting out from the course the materia medica and pharmacy, which were of value to a former generation. But when all has been done in a general way, it will still remain for the conscientious teacher of therapeutics to exclude a great deal that almost every other doctor might think his student ought to be taught. Nothing short of this will bring the subject into such compass that the average student mind will be able to find it more than a mass of unrelated facts and contradictory assertions.

When we come to general medicine and surgery, as they have been understood and taught in the past, we come to the problem of teaching in cognate specialties. For these are little more than parent groups of yet imperfectly defined specialties, from which the more definite specialties, like dermatology and laryngology, are from time to time drop-

ping off. The general principles which formerly justified the titles, "principles of medicine" and "principles of surgery," become more and more scattered to the general branches of physiology, pathology and therapeutics, although they might still be considered together in a philosophy of medicine. In every department of general medicine and surgery, and in every other specialty, there are facts and generalizations of the highest importance to the ophthalmologist, both for their particular significance and the added breadth of view they will confer. The general symptomatology and course of syphilis and tuberculosis has a most direct and important bearing on the recognition and treatment of certain diseases of the eye. A knowledge of toxæmias of intestinal origin may have extremely important bearings on our treatment of toxic amblyopias. But not all the information and deductions that can be brought together under general medicine or surgery are of equal value. The mass is so great that some must be left out. Selection is the crying need in every branch.

No one can pass in review the numberless and vital connections of ophthalmic practice with other branches of medicine and surgery, without being impressed with the necessity for general medical education for this line of practice. The tendency to undertake it without any general knowledge of medicine shows serious defects in the present medical curriculum. It should be understood that the custom of teaching medical students a fair amount of internal medicine and general surgery, and the sending them out to adopt what line of practice they please, and qualify themselves for it as best they can, is doubly disastrous. The doctor of medicine who sets up as an ophthalmologist may be as ignorant of the actual work he is to do, as the counter-prescribing optician, who also founds his hopes of success on self-sufficiency. The public, gaining some inkling of this, estimates the two as approximately equally valuable councilors, and goes to the cheapest. The medical student who subsequently takes up general or family practice, brought up in the same ophthalmic ignorance as his fellow student who has undertaken to practice ophthalmology, is quite liable to send his patients to the aforesaid prescribing optician, with whose particular

brand of ignorance he is less conversant, and who is more likely to offer pecuniary favors in return.

The specialization of education, such as I have here urged, will do two things: it will furnish doctors of medicine really fitted for ophthalmic practice; and it will bind the medical profession together by bonds of mutual respect. It is not possible that special preparation for ophthalmic practice should remain dependent upon individual initiative. It is not desirable that it should be left to brief post-graduate courses, or to the so-called ophthalmic colleges. There is a great and pressing need that stable, conservative institutions of learning of the highest type should offer a formal course fitting their graduates for ophthalmic practice. When this is done it will be found to consist of certain special instruction added to a revised curriculum provided for all students of medicine. And medical education in general will have taken a long step forward.

ESSAYS AND DISCUSSIONS.

A CRITICISM ON THE USE AND ABUSE OF THE LACRIMAL PROBE.

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THE trend of argument to be pursued in this paper is to offer substantial vindication on the one hand that the use of the very large lacrimal probe is bad ophthalmic practice, and on the other to conservatively uphold the employment of the small or medium probes as infrequently as possible. The writer is fully cognizant of the fact that he is discussing a question which has an array of able supporters on either side. He is likewise aware that a greater proportion of them are staunch adherents of the very large probe rather than the small or medium probe for all such conditions for which the writer exclusively advocates the small one. It must be admitted, however, that the adherents of either the one or the other are obliged to look upon those affections that necessitate the use of any probing as a *bête noir* in ophthalmic surgery. Again, there is a good deal of truth in the saying that "If you once pass a lacrimal probe, that patient is liable to become a probe victim for ever and a day." As a matter of fact, all probes are an evil, and the larger the lacrimal probe the greater the ultimate evil that ensues from its unwise employment.

The rather promiscuous employment of the large lacrimal probe had its inception in the use of large sounds for urethral conditions which in part are analogous to those in the lacrimal canal. If there was a closer anatomical analogy between these two canals than really exists, then perhaps there would be for similar conditions more of a justification in

the use of the very large lacrimal probe. The anatomical surroundings, however, being so unlike in their fundamental structures and conditions, the use of the large probe or of large sounds is permissible in the one (urethra) and precluded in the other (lacrimal canal) upon a purely physical basis, if upon no other more valid one.

It is not the writer's purpose to enter into any discussion as to the relative merits of the various kinds of treatment to be pursued in cases of lacrimo-nasal obstructions. But, it is his specific desire to confine himself to such points only as have a direct or indirect bearing on the passing of any lacrimal probe.

It is not contended that a fair amount of rather rapid dilatation of a lacrimal stricture is not a good regimen, but that a rapid and excessive dilatation, as has been the vogue, is a policy to be heartily deprecated. For, the lacrimo-nasal canal permits of but a limited amount of dilatation, and beyond this point you secure a dilatation by compression which verges upon destruction of functioning tissue. The essential factor is not how large a canal can be obtained, but one how nearly physiological. The size of the canal plays no important factor in the drainage of the tears, so long as no actual stricture or other obstruction exists. Clinical demonstrations of this assertion are plentiful and self-evident. Our object should be to restore a patulous canal and interfere as little with the caliber of the canal as is consistent with this object. In the very strict sense of the term there is scarcely an actual canal, as the walls are in contact with each other on all sides. The greatest average diameter of the canal in the cadaver is but scant 6 mm.; while in the living subject it is considerably less because of the periosteum, submucous lining, vascular network, lymph-gland supply, and the ciliated epithelium. The usual diameter of the canal in the cadaver does not exceed 3 to 4 mm., and therefore less in the living because of the anatomical structures just detailed. In view of this then, how can a sound or probe of 3 or 4 mm. diameter enter a rather tortuous canal of practically the same dimension? It cannot do so without injuring the soft tissues and thereby seriously imperiling their proper function.

The physiology of the removal of the tears will offer sev-

eral additional points clearly contraindicating the use of the very large probe. The flow of tears to the nose is not a simple physical phenomenon, but rather a complicated one. Briefly stated, there are six theories which endeavor to explain this act. They are as follows: (1) The siphon theory; (2) the capillary theory; (3) the aspiration theory; (4) the sac compression theory; (5) the sac dilatation theory; (6) the lid closure theory. There are many who accept only one or the other of these theories. The writer, however, maintains that each and every one of the several methods plays a part in the conduction of the tears. Upon carefully considering the anatomy of the canal in relation to these theories of tear drainage, the use of the very large probe is, in the majority of instances, distinctly inconsistent practice. Though there are perhaps conditions arising in certain portions of the canal in which a large probe might be of some service, yet its use being injurious to a part of the canal, is of necessity so for the entire canal. This is upon the principle that which is true of the part is true of the whole. In the normal condition of affairs, the walls of the canaliculus, nasal canal, and to a certain extent the walls of the sac, are in touch everywhere. This contact of walls is obligatory to sustain the capillary theory of the downward flow of the tears. Therefore, our endeavor to establish a large and patulous canal as of necessity must follow the use of the very large probe, is certainly inconsistent with the anatomical condition. It matters not how small the caliber of the canal is, the tears will drain properly so long as no stricture or other cause completely shuts off this little lumen. A canal as patulous as a very large probe would produce has never perhaps been seen in the living subject. Still, it is true that the caliber of the canal and the size of the lumen vary in different individuals and vary in the same canal.

The invariable slitting of the canaliculus, which is necessary in order to insert the very large probes, is an objectionable procedure. Unless there is a stricture or obstruction in the canaliculus, the slitting rather thwarts nature's effort for properly draining the tears. It destroys the even contact of the entire canaliculus with the eyeball, a very important factor. It also does away with the even pressure exerted by

the lids during the act of winking which plays an important part in forcing the tears not only into the canaliculus but also into the sac as well.

Unless the whole length of the canaliculus, including its narrow opening into the sac, is cut and prevented from ever healing, the very large probe will do much damage. For, if this sac opening of the canaliculus is not cut—and it seldom is, or ever kept from healing when cut—the very large probe continually ruptures it and this finally ends in complete obliteration because of ensuing inflammation and cicatricial contraction. Unless this opening is cut, no very large probe can ever be inserted without danger. Not even rapid and excessive dilatation of the canaliculus and its sac opening will permit the entry of the classic large probe, without inflicting permanent injury. The normal calibre of the canaliculus and that produced by the very large probe have opposite tendencies in assisting the flow of tears into the sac; the former assists, the latter markedly retards the flow, because of the principle of capillarity.

In not slitting the punctum or a portion of the canaliculus, the repeated efforts at engaging the large probes will so irritate the surrounding tissues as to cause a thickening and even an eversion of the punctum. Not only this, but the passing of the very large probes without slitting punctum or canaliculus, often stretches the muscular coats so that their contracting power is forever destroyed. The same holds true for the opening of the sac into the nasal canal, as it also has a smaller calibre than the canal itself. Thus, both of these important orifices may be destroyed or obliterated because of the tearing by the very large probe producing cicatricial and granulation tissue.

In the passing of very large probes the frequent attending hæmorrhage is a serious drawback. It means that the tissues have been torn or fissured and that an inflammation will follow with a possible chance of the clot becoming organized, resulting in the formation of new strictures or an actual closure of the canal. Under these conditions one is liable to crowd and push the lining membrane in advance of the probe, either tearing it or making false passages. The constant repetition of this affair in the canal must certainly be fol-

lowed by results of as grave a nature as the condition for which the probe was passed. In addition, the very large probe so crowds the ciliated epithelial lining of the canal against the bony wall as to often produce an actual necrosis in certain portions thereof. This lesion will of necessity be followed by cicatricial tissue and, perhaps, preceded by a rather violent inflammatory reaction. This ciliated epithelium is very essential, not only for the conducting of the tears, but to prevent infectious material from the nose gaining an entrance into the canal and sac. The ciliated epithelium materially assists in the capillary and suction drainage of tears into the nasal cavity.

The end result of the continued use of the very large probe is an abnormally patulous nasal canal with scarcely any normal epithelial lining. This undue size of the canal then freely admits noxious nasal secretions and thereby allows foci of infection. In addition, the frequent regurgitation of air through this canal upon blowing the nose is, to say the least, extremely annoying.

Last, but not least, is the great pain caused by passing these large probes through a canal of a smaller calibre than the diameter of the probe. This pain may last for several days and be accompanied by such an inflammatory reaction as to be quite alarming to both patient and physician.

It, perhaps, has been very apparent that no new objections to the use of very large probes have been raised. New ones are deemed superfluous, as the old ones furnish more than the requisite amount of evidence for the points at issue. Our enthusiasm has been largely responsible for the free use of the very large lacrimal probes. However, the error of our way is gradually clearing up and the true status of the probe is near at hand. The teachings of some in this regard are receiving a severe blow from many a quarter, and deservedly so.

What has been said of the very large probe is equally true of the large style and canula. The particular shape of these large probes does not confer any special benefit as to safety or even end result. The writer is quite mindful of the fact that the admonitions given against the employment of the very large lacrimal probe are true to a limited extent

for the small probe as well. The caution is: Do not use the very large probes, and the small ones as little as possible. In a certain sense, all probes are a menace.

The remarks in the paper can conveniently be summarized as follows: (1) Very large probes cause undue pain; (2) are liable to produce destruction of the membranous lining of the nasal canal; (3) are very prone to produce strictures, or at least cause undue damage to the small opening into the sac and into the nasal canal; (4) are apt to produce an unduly large lacrimo-nasal canal and thus invite infection from the nose or cause annoying influx of air into the canal upon blowing the nose; (5) necessitate undue slitting of the canaliculus, a procedure to be zealously avoided; (6) the possible obliteration of either the canalicular or nasal opening of the sac; (7) the ease with which hæmorrhages are caused in the nasal canal and the attending liability of the clot becoming organized and forming new strictures; (8) the resulting large lumen of the canal is of no actual benefit in conducting the tears to the nose.

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HEMORRHAGE FROM LACRIMAL DUCT FOLLOWING REMOVAL OF STYLE.

By J. C. BUCKWALTER, M.D.

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THE following history was given me by the patient:—
February, 1895, Mr. G. W. C., age 39, weight 210, suffered with a bad cold in the head at which time the right eye teared. After eight weeks of tearing the eye became ulcerated, the cornea mottled and vision very poor. The ulcer was treated six weeks by Dr. M., Chicago, with no perceptible benefit. Dr. B. was then consulted and treated the eye four months. Dr. B. probed the lacrimal duct and lessened the tearing for a time, but the treatment did not improve the corneal lesion.

Several months elapsed without treatment until Dr. F. was consulted in February, 1896. By the application of a Spanish fly blister Dr. F. gave almost immediate relief to the eye, and in seven weeks the eye was well. No treatment had been directed to the tear duct, and it was worse.

In July, 1897, Dr. H. was consulted in regard to the increasing epiphora. The treatment instituted consisted of probing and syringing. After persisting in this mode of treatment some time there was no noticeable improvement in the tearing. At this juncture there appeared for the first time a slight swelling at the inner corner of the right eye. By pressing the lacrimal sac a yellow secretion was forced out. At this time the lower canaliculus was slit, probing and syringing was continued at intervals for some time with very little improvement. Finally a silver style was introduced into the duct. This was removed and cleansed at intervals for some weeks, until the doctor left the city on a vacation for a month. During the doctor's absence the patient received no treatment.

After the lapse of one month the patient returned for treatment. The style was sought for but could not be located at first. Finally it was found imbedded in the duct far down. Several attempts were made for the removal from above downward, and considerable force was used during these attempts. The parts were lacerated and the œdema following the manipulations was marked for several days,

causing the patient to keep close to his office. During the following three months the patient kept away from the doctor. On his return for treatment the weather was severe, so Dr. H. advised waiting.

Not until June, 1898—nearly a year after the first attempt—was a further effort made for its extraction. At this sitting fruitless attempts were made from above through the lacrimal duct, and from below through the nostril. Two months later another attempt was made, but to no avail. Dr. H. now advised to leave the style where it was; that it would cause no trouble.

The patient consulted physicians in various cities. Many tried to convince him that there was no style in the duct. Finally an X-ray examination was made and the operator located the style in the lacrimo-nasal duct. No attempt was made to remove it. Later a physician was again consulted and another X-ray examination made, but the examiner failed to locate the style. (The X-rays are like physicians—prone to disagree.)

July, 1903—six years after the style had disappeared—Mr. G. W. C. consulted me and related the preceding account of his eye affection. Not until two months previous did the style cause any marked annoyance and discomfort, aside from the increasing epiphora, and accumulation of muco-purulent secretion which the patient was compelled to express from the lacrimal sac several times daily. About two months ago the patient first noticed a feeling of stuffiness and frequent occlusions of the right nostril; at the same time an unusual quantity of thick yellowish blood-stained secretion was deposited on the handkerchief at each expulsion.

On inspecting the right nostril I found the mucosa of the inferior turbinate bone congested, particularly the anterior portion, which impinged upon the septum. After thoroughly depleting the mucous membrane with the active vascular constrictors, cocaine and supra-renal extract, the turgescence readily subsided. The floor of the nostril and inferior meatus was filled with mucoid secretion which was removed with a nasal douche. The style could now readily be felt with a probe. It was firmly fixed and the end rested on the floor of the inferior meatus. The lacrimal duct seemed stenosed, it

being impossible to force fluid through it with a syringe or to pass a probe.

One week after the above examination, at twelve o'clock noon, an operation was made in the right nostril for the removal of the style. The nostril was sterilized as thoroughly as possible by means of an antiseptic douche. It was anesthetized by packing with pledgets of cotton saturated with a four per cent. cocaine solution, which remained in the nostril about ten minutes. (I have on several occasions noticed when cocaine solution is left in contact with a mucous membrane over fifteen minutes, hæmorrhage during an operation is usually free.) After removing the pledgets of cotton the inferior turbinate body was swabbed five or six times with supra-renal extract solution. With a Holmes inferior turbinate saw, the anterior portion of the inferior turbinate bone was sawed through, and the isthmus of tissue cut with a Beckmann scissors. Some bleeding accompanied the operation. On delivering the severed piece of tissue with an angular forceps, the nostril was cleansed with a saline solution and the style, which had been loosened when sawing through the turbinate, came away imbedded in a blood clot.

Following the delivery of the style the hæmorrhage was quite free, more than is usual after so slight an operation. The nostril was snugly packed with strip gauze and the bleeding lessened. The patient being anxious to go to his office, was dismissed with instructions to use an ice cold compress to the bridge of the nose, the side of the face and back of the neck, to lie down and keep quiet and to take five drops of adrenalin solution every twenty minutes in case of bleeding. For pain or hæmorrhage, I also ordered one-half grain of codeine every hour.

About three-quarters of an hour after leaving my office the patient returned with sufficient evidence that his nose had been bleeding, and was now bleeding freely. He had used the ice compresses as directed, adrenaline internally and a dose of codeine, to no avail.

I immediately withdrew the gauze packing from the nostril, sprayed it with supra-renal solution, douched with ice cold water and with hydrogen peroxide of full strength, bade the patient lie quietly, placed ice cold compresses to the nose, face and nape of neck, administered by mouth twelve

grains of supra-renal extract every hour, two drops of veratrum viride every ten minutes (the pulse was full and strong, 75 beats per minute) hypodermically, one-half grain morphine and one one hundred and fifties atropine ever hour. In spite of these measures the bleeding continued unabated until 4 p. m. At this time I took the patient home in a carriage. We reached his home in thirty-five minutes. In transit the amount of hæmorrhage did not measure more than three ounces, and when we reached our destination the bleeding stopped, to my great relief.

Dr. J. A. James saw the case during the active bleeding. Dr. M. A. Goldstein saw him at his home when the crisis had passed.

I saved as much of the blood as possible in order to know how much was lost. There were four pans full, holding altogether four and one-half quarts, not to mention that which was caught by towels and deposited in the cuspidor.

Three weeks after removing the style dilation of the lacrimal duct was commenced, and after three months treatment a number six Bowman probe could be passed. The epiphora had nearly disappeared when the patient was last seen, about four months ago.

While the arterial and venous supply to this particular part of the lacrimal duct region is plentiful, there is a conspicuous absence of vessels of importance. There is a profusion of veins surrounding the lower portion, and a dense venous plexus extending throughout the nasal duct. Notice will be taken that on the style there is a deposit. This foreign substance possibly eroded the capillaries, thereby weakening their contractile power, or by lacerating the small vessels laterally—not clearly dividing them—prevented their contraction. The inflamed condition eventually produced in the surrounding tissue by this foreign body demonstrates that a foreign substance is prone to manifest sooner or later that it is alien to such surroundings.

DISCUSSION.

MELVILLE BLACK (Denver): Dr. Buckwalter's experience was so unique that it will be rather hard to find experiences parallel with it. It would seem to me, however, that this hæmorrhage would come under the nasal rather than a

lacrimal hæmorrhage, inasmuch as the operation in the nose preceding the removal of the canula was responsible for the hæmorrhage. I have never had such an experience, but I have never tried to remove a lacrimal canula from the nose. I had one patient who had a lost lacrimal canula, and believing I could best serve her by extirpation of the lacrimal sac, I proceeded to do that, and removed the canula at the same time. This, in my opinion, is the best way to find these lost canulas. I have had considerable experience with the use of canulas, and the more I have the more I dislike them.

As regards probing the lacrimal canal, I have always been favorable to the large probes. It has always seemed to me that if we are going to probe at all it is advisable to use a probe large enough to produce pressure. I cannot see any use in tickling the canal, and that is about all a small probe does. The longer I live, the more I think that probing does not effect a permanent cure, especially in cases that have reached the stage of purulent secretion. I used to think my cases got well, but I guess these cases went to some one else. The others came back later for more treatment, hence I am skeptical of these cases being cured by any form of treatment. In consequence, I lean more and more towards extirpation of the sac. It does away with the purulent secretion, the formation of pus, etc., and the patient is made comfortable and saved the trouble and pain of probing.

A. ALT (St. Louis): I agree with Dr. Black that this was a nasal bleeding and not a lacrimal bleeding. I thought of a similar case in my early ophthalmologic experience. The patient came to me with a lacrimal stricture. He told me that months before, while the doctor who treated him probed the canal, he had a sensation of something breaking, but he was told it was all right. I found considerable swelling in the lacrimal sac region, and on probing found the end of a silver probe that had remained in the lacrimal duct. I withdrew it with great difficulty, but no hæmorrhage followed.

With regard to the large probes, I am of the opinion of Dr. Suker. I have never had a probe put into my nasal duct, but I have put some very small ones into patients' ducts, and if they do not cause pressure I do not know what pressure is. I have never been able to understand the experience of

Theobald, who, experimenting on dry skulls, came to the idea that such large probes would be useful. I never use them myself. I also agree with Dr. Black that the more I use them the less I think of the value of probing, and I gave up the slitting of the canaliculus many years ago. If I cannot get in with a small probe at first, I use the dilator. The largest I have used for years is No. 6, and when there is pus, I make simply injections. I do not know if we accomplish much by this, but the patients want something done, and I suppose I will also have to practice the extirpation of the sac.

B. E. FRYER (Kansas City): I agree with Dr. Suker in regard to the large probes. If we remember the pathological conditions, we will see that we only add to the trouble by the use of the large probes. We have more or less cicatricial tissue, and the large probe and the sudden stretching will set up an increased amount of scar tissue in and about the canal. I agree with Dr. Alt and Dr. Suker in regard to not slitting the canaliculus, but disagree with them that slitting it necessarily interferes with the capillary power of the punctum. I do not do it any more, but if properly done this need not be brought about. Using the knife and cutting the lid towards the globe of the eye, we can still keep up the contact of the lid opening with the eyeball, thus retaining the capillary action in draining.

A. H. ANDREWS (Chicago): I had a case which came to me with a lost canula, and I was able to locate it underneath the inferior turbinal. A little pressure on the lower end pushed it up where I could get at it without much trouble. The canula was filled from one end to the other with granulation tissue. It had not been draining for a considerable time.

With regard to the use of probes, I am inclined to think that the value of any probe, whether large or small (and I am disposed to use the small rather than the large), will be greatly increased by the use of an electric current in connection with the probing. Either the positive or negative, as indicated, has decided therapeutic properties, and I am unable to see any reason why these therapeutic properties are not to be employed in the use of the probe in opening and making permanently open the lacrimal canal. The little experience which I have had has been much more satisfactory to me than

the use of the probe has been to the gentlemen who have been discussing this paper.

DUDLEY S. REYNOLDS (Louisville, Ky.): There are cases in which the slitting of the canaliculus and the introduction of probes are necessary. No one, I presume, would undertake the cure of a purulent infection of the sac without dividing the lower canaliculus to secure free entrance of the syringe and exit for the accumulated pus below. In cases where no infection exists, I have reached the conclusion, as a matter of personal experience, that probing is undesirable and in most cases injurious, and where probing is often repeated it gets to be of almost daily necessity. The patient finally growing tired of this daily procedure seeks other counsel, and he goes from one to another, and you will occasionally see a patient after ten years still unrelieved. We rarely find one entirely recovered through the probing. Where there is no purulent infection it will often be found that narrowing of the puncta causes the stillicidium. I have lost confidence in the theory of the mal-position of the punctum. I have known cases where dilatation of the punctum as the only local treatment, repeated two or three times, resulted in recovery. In many cases small doses of iodide of potassium would be sufficient to bring about a cure, but not in cases that have been subjected to the treatment by the probe, either large or small. Other cases are relieved by the injection, with a syringe, of a drop or two of the solution of adrenalin 1-1000. A large number can be fairly traceable to obstruction in the nasal passages, and the removal of the inferior turbinal bone does away with the difficulty. As to those cases in which it seems necessary to use the canula, some of them do well and some do not. I have had three or four cases, all in recent years, where I have seen impaction; one case where I had introduced the canula years before came suddenly to me with great pain in the side of the face, swelling in the region of the lacrimal sac, obstruction in the nose, and stillicidium. A search of the sac failed to disclose the presence of the canula, and a careful probing beneath the inferior turbinate bone found it tucked down tight. I seized it with forceps and made gentle traction and it came away in two pieces. It had become eroded and broken. In such a case, the introduction of a probe becomes necessary to insure the thorough washing

of the passages, which I prefer to do with the normal salt solution, containing one grain of bichloride of mercury to the pint.

J. A. DONOVAN (Butte, Mont.): I believe most of these cases are reflex, probably due to conjunctivitis or some nasal trouble. A patient who was treated three months in Paris, consulted me on her return. I removed a small strip of the lower turbinate, after which she got well and remained so. I disagree in the matter of probes. As was said, in most cases they are entirely unnecessary, but where necessary should be used. I can recall many cases treated previous to the last three years, and every one got well and remained so. I used them in one-fourth or more of my cases. I use the Theobald probe, and always pass the largest I am going to use the first time, using cocaine or general anæsthetic. I start with a low probe and use up to 12, 14 or 16 at first sitting. Where there is a history of having been treated by somebody for years, I use the probe until I feel a slight cracking in the bone. In about three days after this I pass a probe one or two sizes smaller, repeating a dozen to fifteen times when I consider the case well, and so far have had the good fortune to have them remain so.

DR. BUCKWALTER (closing discussion): In the case of hæmorrhage, it does not seem to me the bleeding came from the nose, from the fact that on inspection the bleeding seemed to ooze from the region of the nasal duct, and pressure with adrenaline over the severed part of the turbinate did not control the hæmorrhage a particle. In this case I could not feel the end of the style by passing a probe into the lacrimal duct. By probing in the nose it was felt firmly fixed. I removed only the anterior part of the turbinate; the area exposed was not great. In treating epiphora, I agree with Dr. Reynolds that a great many cases are due to pressure stenosis, a congestion of the part of the lacrimal duct known as the naso-lacrimal duct. I have treated several cases in which probing had been carried on from a few weeks to a year or more, and I reported three cases in which I operated on the inferior turbinate, removing a portion of it, and treating the inferior meatus. The idea is to relieve the congestion about the mouth of the tube. The lacrimal duct is a drainage duct, and it seems to me if you have inflammation of the sac, you have a stoppage of drainage, and you

must re-establish drainage in order to keep up a constant flow of tears. By relieving the mouth of the sewer you relieve a great many of these cases.

DR. SUKER (closing discussion): I see that the consensus of opinion is about the same as I have expressed in regard to the use of large probes. Our effort should be directed towards restoring, as nearly as possible, the normal condition in the canal. If you pass very large Theobald's or Bowman's probes you will not restore the natural condition. The canal is for drainage, and must not be robbed of its anatomical elements by undue probing. I have seen a number of cases where exceedingly large Theobald probes were passed, and they still complain of the trouble. The final treatment, and perhaps the only radical one at present, is the extirpation of the lacrimal sac, with the proper attention to any existing conjunctivitis.

REMARKS ON GLIOMA OF THE RETINA AND THE QUESTION OF ROSETTES.

BY ADOLF ALT, M.D.

GLIOMA of the retina is a well established clinical entity. It is a tumor of the retina which makes its appearance in infancy, frequently at such an early period of infancy that that it may be considered as congenital, and, if left to itself, not only destroys the eye or eyes affected, but the life of the afflicted individual in a comparatively short space of time. Its malignancy, equal to that of the small cell sarcoma, while varying in intensity, is its chief characteristic feature and the cases reported in earlier literature in which gliomata are said to have undergone a regressive metamorphosis which led to a cure, must, in the light of modern science, probably be rejected as errors in diagnosis. We know now that a child affected with glioma is doomed to an early death and under horrible circumstances, unless the eye be removed at the earliest possible date. Even then, however, our efforts may be and are often unsuccessful, although every one of us probably have had a number of cases in which the early removal of one such eye or perhaps of both, saved a life. There is little to add to the well known clinical picture and it is not the object of this paper to waste time with it.

It is different with our knowledge of the genesis and histopathology of this terrible disease, and, while much time and intelligent labor has been bestowed on the unraveling of its secrets, we have, I think, not been altogether successful in determining its true nature and origin.

In discussing the pathogenesis of glioma we have to turn back to its first intelligent description. In his classical lectures on tumors, on which the modern views on glioma are based, (Berlin, 1864) Virchow says: "The nature of the neuroglia differs very much in different places. It is sometimes firmer and more like connective tissue, sometimes so soft that it appears as an amorphous or granular substance. The structure of the neuroglia, where it is most characteristic, is such that we find round, lentilshaped, or spindleshaped, or branched cellular elements, lying at some distance from each other in a very soft and therefore very easily destroyed substance which is at once changed by pressure, water, and so on, and which when examined in a fresh state has a finely granular appearance. * * * *

* * * * This substance appears traversed by fine fibrillæ crossing each other in all directions, of which it is difficult to say, whether they are preexistent or result from a coagulation of the original substance. * * * *

* * * * The cellular elements contained in this substance are extremely friable so that in consequence of cutting, pressing or teasing the majority is destroyed and only their nuclei are found surrounded by a loose substance which is not unlike the intercellular substance. * * * *

* * * * It is not at all certain whether these cells are round or branched. In hardened specimens it appears often as if the fibrillar network was formed by the cell branches."

A more localized hyperplasia of this tissue he terms glioma and gives a very detailed description of the different forms of glioma of the brain. Their course is in general a very slow one and they may grow to a considerable size before causing any morbid symptoms.

He later goes on to say: "Into this category we must place certain tumors of the retina, which thus far have been called carcinoma bulbi. These are progressive growths, coming from the soft connective tissue of the retina, which in their

structure correspond exactly with the brain tumors just described. But, it is very difficult to sever them from sarcomata, etc." Later on again he says: "I have already stated that there are transitions to sarcoma and that these gliosarcomata give us much matter for thought."

In the following decades numerous investigators added but little to Virchow's description. The main question raised was always, whether we had to look upon glioma as a special form of tumor grown from neuroglia or as a small round cell sarcoma, and in this question no uniform opinion has been reached even to this day. My own leaning was always towards the sarcoma side, since I could and cannot understand, how glioma of the brain, a comparatively slow growing, almost benign tumor, and glioma of the retina a rapidly growing, destructive, and extremely malignant tumor, could be essentially the same. The different authors have found retinal glioma to spring in turn from all the different layers of the retina, yet, we can hardly say that these statements are of real value as glioma has so far not been seen in its earliest beginning. Most observers think that one of the granular layers gives rise to glioma. Since Ginsberg has found in two microphthalmic eyes the elements of which the retina consists were in places transposed, so that elements of one layer were situated in one to which they did not belong. Greef believes that in accordance with Cohnheim's theory we may assume that glioma may and probably always does spring from such misplaced tissue germs. Greef himself and after him Hertel have found glia cells (spidercells) in retinal glioma by means of the Golgi-Cajal method. They and other observers have also found ganglion cells and Lagrange went even so far as to distinguish between four different forms of glioma, one of which he characterizes by the presence of ganglion cells. Having examined a considerable number of gliomata and having as a rule found smaller and larger parts of retinal tissue still recognizable, even in the interior of tumors which filled the eyeball, I cannot see why such findings should be looked upon as anything extraordinary. These cells are probably nothing else but the remnants of the affected retina and not newly formed. Their presence seems therefore quite natural.

Aside from ganglionic cells I have often found whole patches of neuroglia cells and fibres which evidently belonged to the inner layers of the retina and which were undoubtedly preformed and not belonging to the new growth, although they were burried within it. (Fig. 1).

We differentiate, as is well known between two forms of glioma: glioma endophytum, in which the growth at first affects the inner parts of the retina and grows inwards towards the axis of the eye squeezing the remains of the retina towards the sclerotic and later on the lens and iris

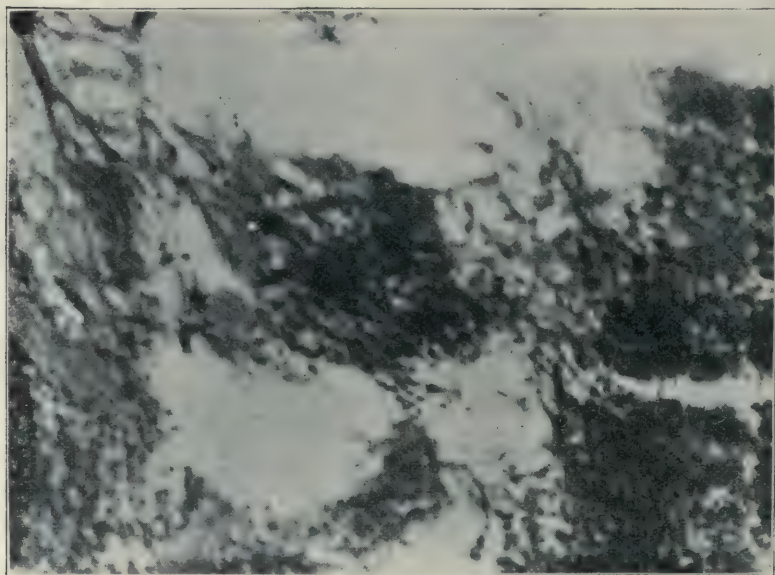


FIG. 1.

against the cornea; and a glioma exophytum, in which the tumor springs from the outer layers of the retina and leads at an early stage to detachment of this membrane. In the progress of the disease, the regular typical stages of all intra-ocular growths are gone through till perforation occurs at the corneoscleral margin or backwards into the orbital tissue and metastases occur in the cranium and distant organs leading to death.

It is now generally conceded that the typical structure of glioma is that of spherical and cylindrical lobules, almost each and everyone of which has a centrally located bloodvessel.

The glioma cells thus forming a spherical or tubular mantle around the bloodvessel are biggest and most vigorous in the immediate neighborhood of the vessel, but at a certain and strangely uniform distance from the vessel they abruptly show all the characteristics of degeneration. New cell cylinders may grow into this degenerated mass and when the whole eyeball is filled with glioma, the typical structure may no longer be recognizable and the tumor appears to consist solely of round cells of varying sizes with here and there a bloodvessel. Evidences of frequent hæmorrhages into this tissue are never wanting, even in small gliomata.

When examining into the nature of the cells of which the tumor consists we can distinguish the following:

1. Small round cells, often giving off small branches and thus appearing bipolar or multipolar, of which by far the largest part of the glioma consists. They have a large nucleus and very little protoplasm. As stated above Greef and Hertel seem to have proven these to be neuroglia cells in the sense of Virchow's description.

2. Larger, sometimes very large, round cells containing cell débris and pigment granules, probably leucocytes. Also polymorpho-nuclear leucocytes and round cells with an oval nucleus.

3. Slightly spindleshaped or clubshaped cells, especially directly around bloodvessels.

4. Ganglion cells.

5. Pigment epithelium cells, often only recognizable as such by a few pigment granules.

The authors are not agreed whether or not there is an intercellular substance between these cells.

Besides the cells there are fibres and sometimes fibrous septa, remnants of the fibrous structures of the retina and atrophied bloodvessels.

The bloodvessel walls are seen to undergo different modes of degeneration, the hyaline degeneration of the endothelium (Fig. 2) as well as of the outer walls, being the most frequent. Later on deposits of lime take place within the tumor and in its periphery. They appear first as small roundish bodies enclosed in cells, later on greater quantities may form large plates and roundish conglomerates. The

quantity of such lime deposits varies greatly in different tumors.

In a number of gliomata certain figures are found in the sections among this apparently uniform mass of cells which while well known long ago, were not looked upon as anything important and which were thought to be due to the infolding of the retina, until in 1897 Wintersteiner published his startling monograph on *The Neuro-epithelioma of the Retina* imparting a particular and important role to these formations. He described them under the name of *Rosettes* in the following

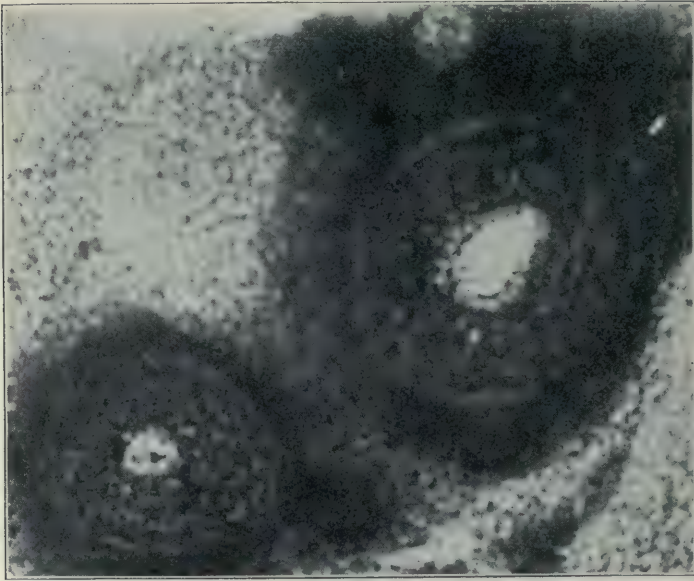


FIG. 2.

manner: "In the most pregnant cases rosette-like formations are found which with a low and medium magnifying power look very much like transverse sections of glandular tubes. They consist of from 12 to 20 slender, cylindrical cells arranged in a circle. In their club-like broader distal end lies the round or oval nucleus, while towards the lumen we find a small amount of protoplasm which is at first broad and then narrows neck-like, and finally swells up to a basal plate ending in a sharp glistening line. The "feet" of these cells touch each other, so that their basal lines together form a continuous basal membrane toward the lumen. The lumen

of the rosette is mostly empty, but frequently I could detect some contents within it, viz: 1) small club or rod-shaped elements which are stained only with protoplasmic stains and which adhere with their smaller ends to the basal membrane of the cylindrical cells, or lie free in the lumen; 2) cells which are in every respect like the cells of the tumor, just as they are lying outside of the rosette." He further states that these formations are essentially hollow spheres, although they may have an opening on one side where the margins may

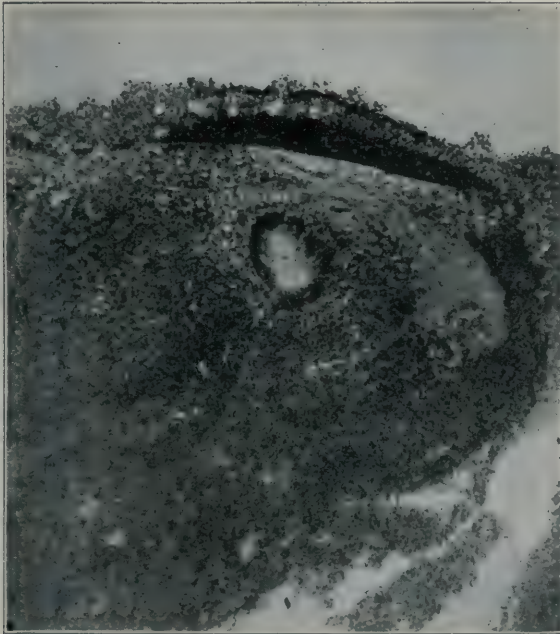


FIG 3.

be rolled in, as seems to be the rule, so that tumor cells can penetrate into the cavity. In this way he explains certain spiral figures and partial rings. The shape and number of these formations vary greatly in different tumors. Sometimes they seem to be altogether absent, in others they are so frequent that they fill the whole field. Neither is there any rule as regards the locality in which they are found within the tumor. He even found them in an extra bulbar growth in the neighborhood of the optic nerve.

As to their origin Wintersteiner comes to the conclusion

that: "These rosette, ribbon and arc-like cell formations must be looked upon as aggregates of rod-fibres and, perhaps, cone-fibres. Their nuclei, therefore are the equivalent of the granules in the outer granular layer, the glistening line toward the lumen of the rosette of the *limitans externa* and the particles of protoplasm which adhere to it are rudiments of undeveloped rods and, perhaps cones." Thus, what had been considered as accidental, natural and unimportant, was by Wintersteiner given such an important place

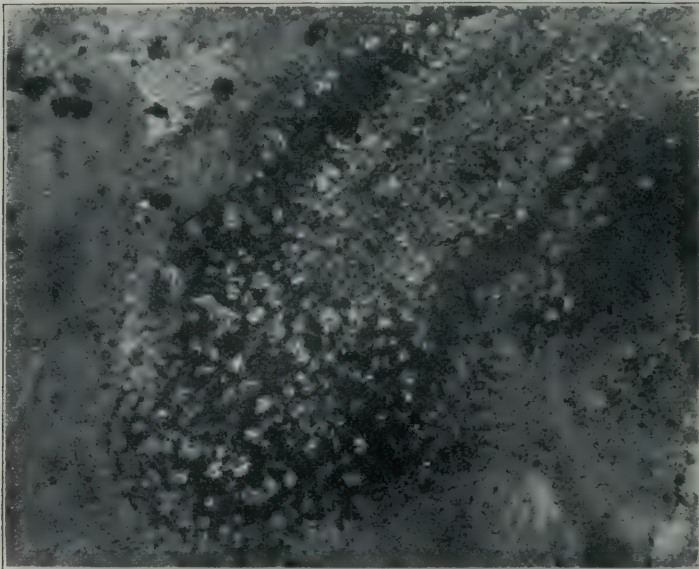


FIG. 4.

in the histogenesis of glioma of the retina that he even gave to the tumor the name of *neuroepithelioma retinae*.

Ginsberg does not accept this view and thinks that the cells forming rosettes are not neuroepithelial in nature, but rather cells of the primitive retina which have not yet been differentiated into spongioblasts and neuroblasts and he compares the cells forming the rosettes with those of the *pars ciliaris*, which indeed they resemble very much. He thus, also, considers them to be different in character from the glia cells.

Greef, while accepting Wintersteiner's views as to the rudimentary neuroepithelial character of the rosettes, says:

"Glioma is a tumor which takes its origin from a malformation in the retina, from misplaced embryonic cells. It consists in the main of hyperplastic glia cells and a network of fibres formed by their branches."

According to these views, then, what has been described as a scant granular intercellular substance, seen by some, denied by others, probably is the fibrous network belonging to the glia cells, and the rosettes are due to different tissue elements.

In 1901 Brown Pusey having stained glioma sections with

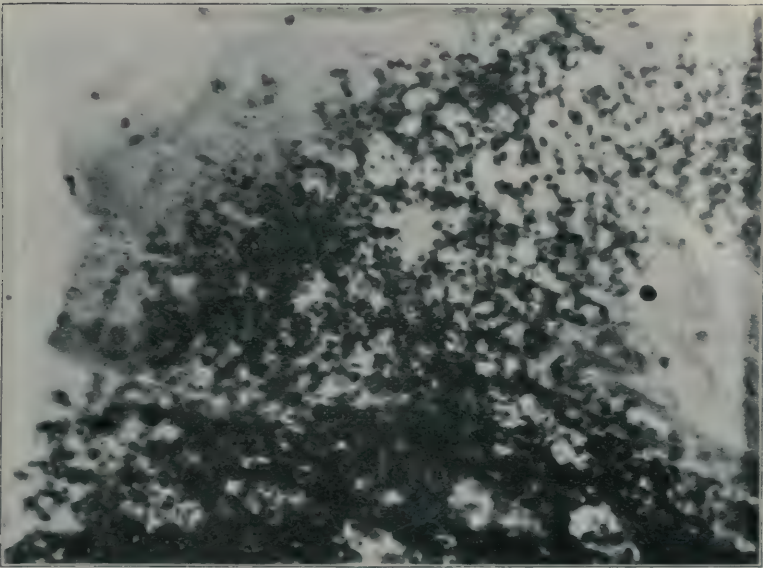


FIG. 5.

Mallory's phosphotungstic hæmatoxyline thought he had proven that fold of the inner surface of the retina formed the rosettes and that the glistening line described by Wintersteiner was nothing else than the membrana limitans interna retinae. In a more recent paper on retinal rosette formations of neuroglia in inflammatory processes, he acknowledges that this was a mistake and he declares himself satisfied that he had to deal with the membrana limitans externa. However, the rosettes which he described and which are of common occurrence and well known to every eye pathologist seem to me to differ from what Wintersteiner called rosettes,

since they are undoubted remnants of a once fully developed, but diseased and partly destroyed retina, just as we find them in a great many specimens of detached retinae, the atrophied folds of which are glued together, as they may even as such be found, also, in cases of glioma, where they can always be recognized as folds of the formerly fully formed retina. (Fig. 3). Even Murakami describing such rosettes in a microphthalmic eye, in my opinion, has fallen into this error.

Brown Pusey further on in his last paper says: "It may

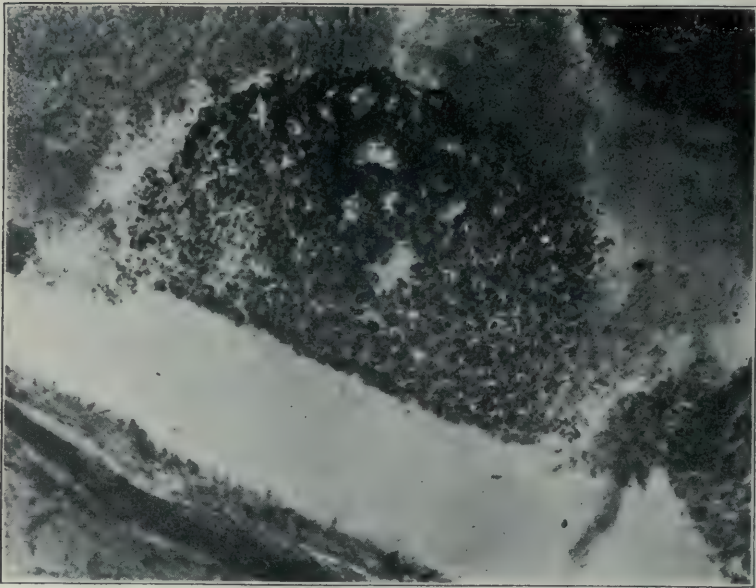


FIG. 6.

be permissible to say that the conclusion that the rosettes are neuroglial in character is much more in harmony with the general teachings of pathological anatomy and is more nearly what we would expect, from the findings of *similar rosette formation in gliomas arising in the brain*, than the suggestion that these formations are made up of cells which form rudimentary rods and cones.

Being convinced of the fact that Wintersteiner must mean something quite different and having recently obtained a number of glioma eyes from my own practice and that of others, I studied these as carefully as I could in order to

have an opinion of my own on this question. The results of this study I wish to bring now before you and to illustrate with numerous photographs. I had at my disposal specimens of nine older cases of glioma from my own collection, five specimens kindly loaned me by friends and two new cases of my own. These latter eyes I cut in series without interruption. The rosettes of Wintersteiner I found in five of these cases. Whether they might not have been found in most or all of these cases, had a sufficiently complete examination been made, is impossible to tell. At any rate the rosettes which I have found correspond in the main with the de-

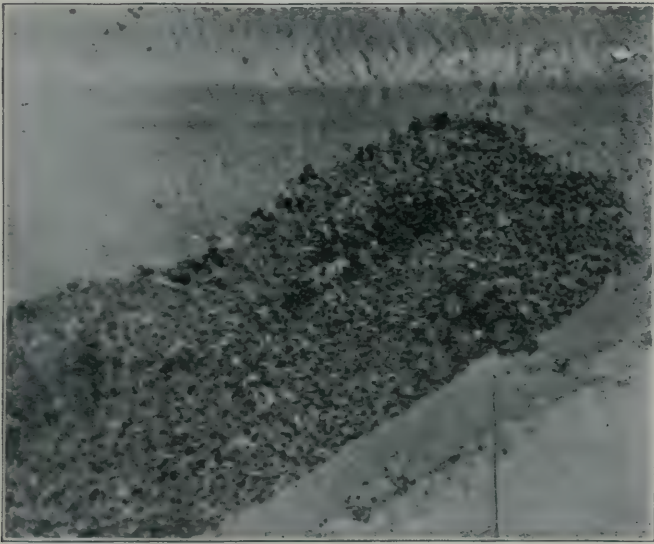


FIG. 7.

scription and drawings of Wintersteiner and cannot be confounded with folds of a previously well developed retina, as described in the cases of Pusey and Murakami.

In trying to get an understanding as to the nature and origin of the rosettes I found in these glioma specimens, as I had seen previously in many degenerating retinæ, a large number of openings, transverse sections of small cavities, especially where the outer layers of the retina could still be recognized and which I thought might have some bearing on rosette formation. It seems that these openings are lying more especially in the external granular layer. (Fig. 4). While

they usually appear to be empty or perhaps to contain a colorless perfectly transparent fluid, they are in some sections traversed by numerous fibres which can be traced back to the cells from which they spring and which I take to be neuroglia cells. Such cells and fibres are found quite frequently also in parts of gliomata, where from their arrangement there must be looked upon as belonging to the inner layers of the retina. (Fig. 5). The exact character of these openings it is difficult to deter-

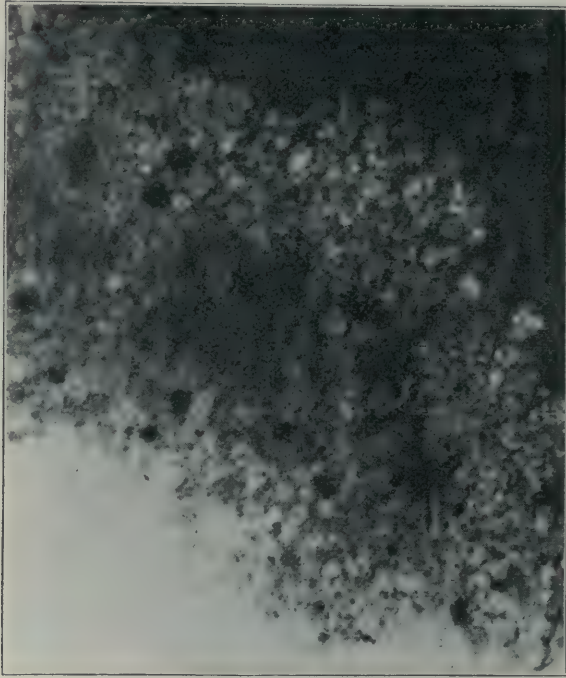


FIG. 8.

mine, unless, they are akin to the larger cavities formed for instance in so-called gliosis of the spinal chord, where they are considered to be due to the degeneration of glia tissue. It, therefor, does not seem that these particular cavities have anything to do with the formation of rosettes. But there are other openings to be seen, especially in the sections of young nodules which are just formed or forming on the choroid, sometimes, also, in a remnant of vitreous body. (Fig. 6 and 7). These look much more like the Wintersteiner rosettes and differ from them only by the fact that the lumen always

contains one or more pigment epithelium cells, or normal or degenerating red blood cells. Still, I think that these are really rosettes in their earlier stages. The tumor cells surrounding these openings have no peculiar shape; they are simply round cells, but they are pressed together more closely than those lying more peripherally.

In the periphery of the tumors and in the secondary nodules, which grow up like plants from seed, wherever glioma cells have happened to fall, pigment epithelium cells are very frequently found enclosed between the tumor cells. Such a pigment epithelium cell having become destroyed and the pigment having been carried away, may well leave behind a hollow sphere to mark its former site.

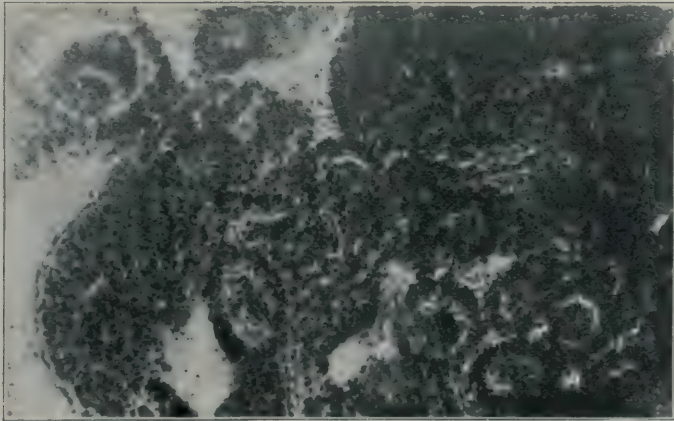


FIG. 9.

In eyes with a detached retina, especially after an injury to the anterior part of the eye, we often find a coagulated exudation filling all the space between choroid and retina. In such cases the exudation, where it lies on the pigment epithelium, looks as if it had been corroded, because every pigment epithelium cells is surrounded by a clear, perfectly transparent spherical area, and even when the pigment cell itself has disappeared, such a clear space marks its former position. Whether this is an exudation from the pigment cell or not, is hard to say, but it seems that a similar formation might also take place when a pigment epithelial cell is surrounded by glioma cells. (Fig. 8).

Such observations, and others which I shall detail, make it very probable that Wintersteiner rosettes may be found when glioma cells grow around some tissue enclosure, and there is much to offer in support of such a view.

It is a striking fact that the tendency of growth in a glioma is not in a plane, but in a spherical or cylindrical manner. Young nodules spring forth from older ones in a way which may best be compared to the formation soap bubbles, only the glioma nodules are solid. Only where the glioma tissue encounters a more resistant tissue, like the *limitans interna*

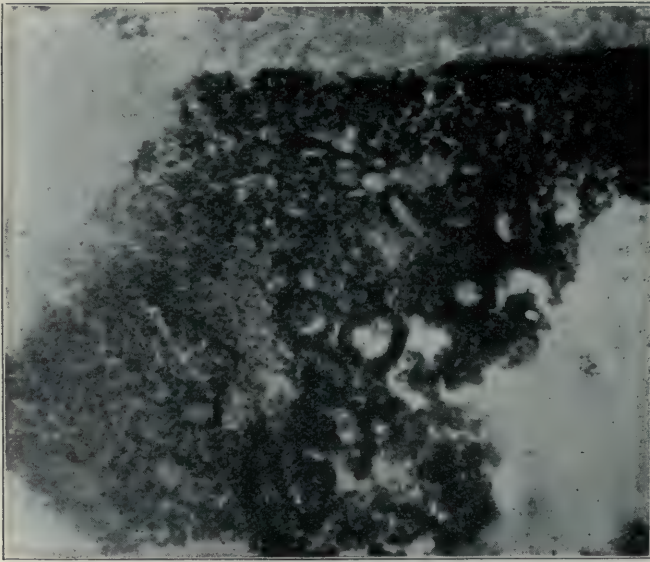


FIG. 10

or externa of the retina, or the lamina vitrea of the choroid, does it grow for a time in a plane along such an obstacle, till it has broken through it in some place, when at once a spherical growth begins. Such facts can be best studied in the peripheral, the younger parts of the tumor. As a rule, every such spherical and younger bud shows a centrally located bloodvessel, around which the cells seem to group themselves; when by pressure the spherical growth is forced to assume a cylindrical or tubular shape, the bloodvessel lies in its axis. In the early stages the tumor cells immediately surrounding such a bloodvessel are round and of the same shape as the more peripheral ones. (Fig. 9). In older nodules, however,

these more densely packed, central cells often—not always by any means—assume a cylindrical or spindle shape and thus in the sections form a marked darker ring around the bloodvessel wall. Should in such a case the bloodvessel wall become degenerated and disappear, the result would be, and I think often is, Ginsberg's statement notwithstanding, a Wintersteiner rosette. Yet, Wintersteiner says the rosettes are made up only of rudimentary rods or cones, or tumor cells. Even if I should be wrong in the opinion that rosettes may be formed in the manner just described, I have found numer-

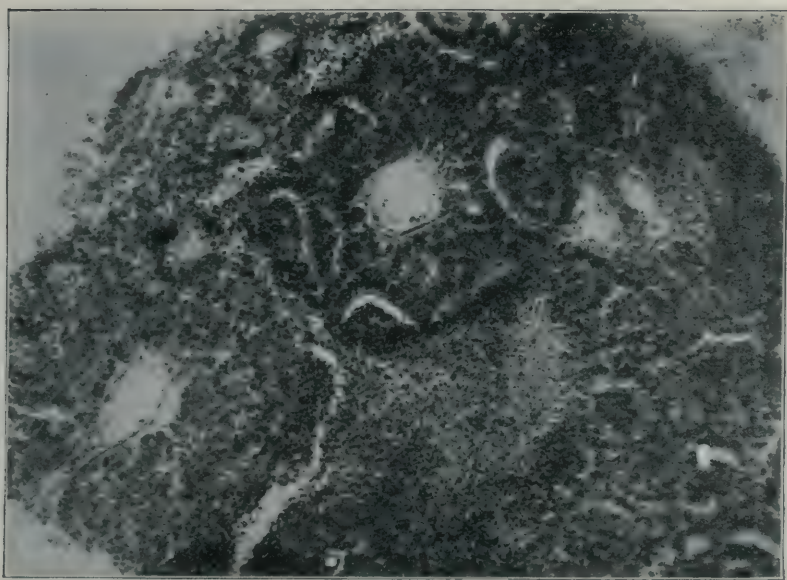


FIG. 11.

ous rosettes which instead of being characterized by the so-called rod and cone fibers and cells with a *limitans externa*, are formed by round cells in no way different from the other tumor cells in their neighborhood. (Fig. 10). Many of the formations I have seen are so grotesque in shape that the hollow sphere of Wintersteiner and other observers can have had nothing to do with their formation. There is nothing unreasonable in assuming that in the same manner as rosettes maybe formed around bloodvessels, they may also be formed around lymph channels, whether these are preformed in the retina or newly formed during the growth of the tumor.



FIG. 12.

If, as some authors will have it, the peculiar shape of the cells composing the ring around the bloodvessel is due to their lying so closely to the source of nutrition and consequently overfeeding, the same may be the case with the cells surrounding a lymph channel.

Many rosettes in my specimens do not simply form a ring

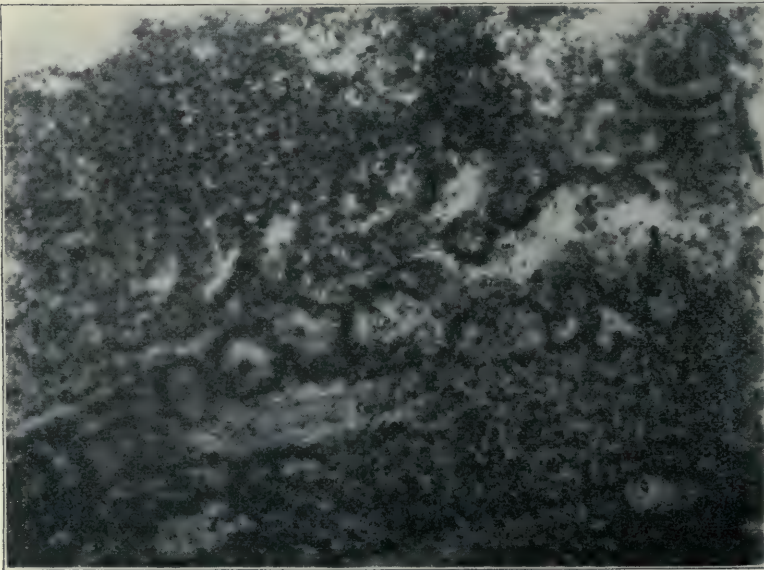


FIG. 13.

and only one ring. (Fig. 11). The majority, even, form curved channels, sometimes arranged in such a manner that the similarity to the distribution of small bloodvessels is very striking. (Figs. 12 and 13). These, as well as rings, have often a central mass of tissue, tumor cells, I think, surrounded by a transparent, perhaps empty, space. Two rings surrounding such a cell mass concentrically are quite frequent. (Fig. 14). The glistening membrane which Wintersteiner calls the *limitans externa* and which he finds almost always, is often absent, or, as Ginsberg says, it is

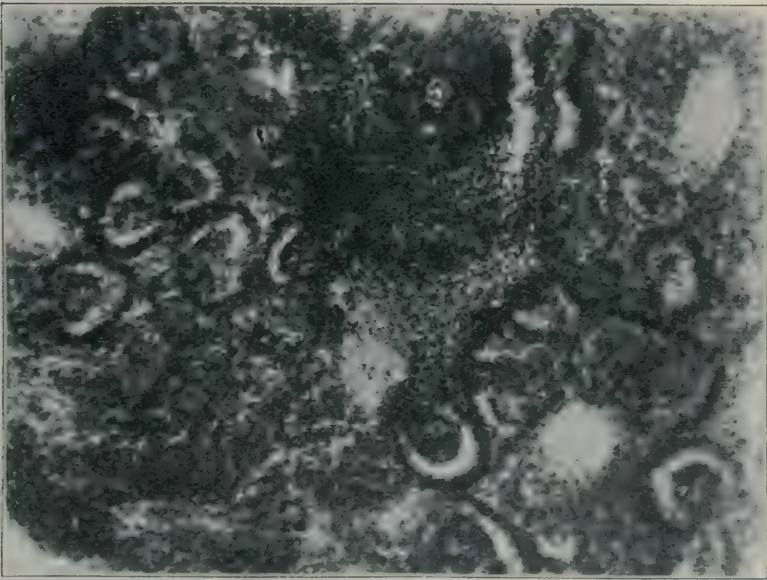


FIG. 14.

simply the sharply defined outline of the ends of the cells surrounding the opening.

While the foregoing seems to point to the fact that rosette formation is due to the growing of tumor cells around a tissue enclosure, I am not at all blind to the fact that many tissue enclosures do not produce rosettes. There must evidently be certain special conditions present which lead to rosette formation, perhaps of an osmotic nature.

If the rosettes are not due to rudimentary rods and cones, the importance given to them by Wintersteiner, and the name neuro-epithelioma, are out of place.

Pusey, without giving his authority, says that rosettes have also been found in glioma of the brain. This would decidedly support my views.

He also gives to the presence or absence of rosettes in a glioma a practical side, by asking whether retinal gliomata with rosettes are less malignant than those without such formations. A priori, I should from the foregoing say that their presence or absence can have no bearing on the clinical character of the tumor, and, in fact, from observation in some of my cases, I know this to be so.

Rosettes, therefore, may be looked upon probably as mere accidents of growth in a glioma.

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DISCUSSION.

DR. H. GIFFORD (Omaha): I cannot say I have any important contribution to make, but I think Dr. Alt's observations are worthy a great deal of consideration, because this question, from a microscopic standpoint, is important. I rise particularly to see if I can get any light on the clinical diagnosis of glioma. I have under observtion now a child, I have kept track of for the past six years, who came to me with the typical picture of glioma. I was on my guard against making a snap-shot diagnosis of glioma, fearing it might be a case of pseudo-glioma, as I had been fooled on that in my earlier career. It had none of the history of the slight or severe inflammation which is apt to preceede the pseudo-glioma, but all the appearance of the yellow, glistening nodules coming out in the clear vitreous, and none of the dull yellowish appearance of pseudo-glioma. Altogether, I felt justified in saying that the child had glioma without

question. The mother declined to have the operation done, but she has brought her in for examination every six months since. The tumor has kept increasing, at no time showing signs of inflammation. The lens has become opaque in a peculiar way, having a yellowish, uniform appearance, and now looks like a celluloid imitation of ivory. This fills up the whole lens capsule. The child is perfectly well, and although I have tried to get the specimen every time I have seen the patient, I have not succeeded yet. I may have made a mistake. It is a question whether some gliomata do not last longer than we expect without killing the patient. The pressure was at no time increased. On the other hand, it has not decreased. The iris is perfectly uniform and normal in appearance, except slightly pushed forward out of the normal plane. Another case is that of a little girl in which I enucleated the eye some fifteen years ago, in whose case the diagnosis was also apparently unquestioned and in which I confirmed the diagnosis with the microscope. My sections showed that the glioma cells reached back into the optic nerve, clear back to the point where it was cut off. I recommended most urgently that she have an evisceration of the orbit. The parents refused to have any further operation performed, and yet the girl is alive and well to-day.

DR. EDWARD JACKSON: Dr. Gifford's case of a child under observation for six years with an ophthalmoscopic diagnosis of glioma, without the usual progress of the case, brings to mind one I have seen where the microscopic appearance justified the diagnosis of glioma. The lens was clear; the anterior portion of the vitreous was clear, but the upper two-thirds or three-fourths of the vitreous were apparently filled with the mass. This occurred, however, in a woman of 40 years of age, with a history of an eye blind for many years, and of course the probable diagnosis is cystic degeneration in the retina; but it raises the question whether Dr. Alt's observation as to the cavity formation around epithelial and other cells derived from the normal tissue, offer any explanation of these rare cases that have been reported, some of which have been enucleated for glioma, and which are certainly not of the malignant character of glioma. It is the only case of the sort I have ever seen, where I thought the ophthalmoscopic diagnosis of glioma would be

justified, but where the patient had been for years without change and the tension remained perfectly normal.

DR. B. E. FRYER (Kansas City): The Academy is to be congratulated and should be thankful for this admirable paper with illustrations by Dr. Alt. There are very few of us who have the patience to go through the work required to produce such a paper, to say nothing of the illustrations. Moreover, there are very few, even, well advanced pathologists who know how to interpret all that is shown here, as he does so perfectly and fully. From the standpoint of a pathologist, it seems to me the Doctor has made everything very, very clear, and he should be congratulated and thanked for it. It would also seem that such observations confirm the Cohnheim theory more completely, and, while it is still under judgment of the pathologists, I feel that it will be more and more confirmed.

DR. EUGENE SMITH (Detroit): I wish to report a case seen in consultation. It was a glioma of the retina, as far as I could tell, but the pathological examination showed it to be an unpigmented round cell sarcoma. The eye was enucleated, supposing it to be a glioma of the retina. I would like to ask if a case of that kind is as malignant as the gliomatous sort. Would that have some bearing on these cases living for some time? Are such cases rare?

DR. ALT (closing discussion): In regard to the case of probable tumor of the retina which Dr. Gifford reported, I had a similar experience eight or ten years ago. A boy between five and six years old was brought to my clinic. He was blind in one eye, and I found a tumor mass in the vitreous which filled the posterior half of the vitreous cavity with the retinal bloodvessels, as I took them to be, on the surface. They were so arranged. We must not forget that we do not really see the glioma, but only the anterior portion of the retina. My diagnosis in this case was glioma, and I wanted to enucleate the eye, but was not allowed to do so. I found on examining the case carefully that the child was the subject of hereditary syphilis, and instituted a vigorous anti-syphilitic treatment. After five or six months the tumor began to shrink gradually and to get smaller and smaller, and about a year and a half from his first visit to me I found there was no tumor, but the retina, with numerous atrophic patches,

was back in its normal position. It thus became clear that it was a gummatous tumor of the retina which had grown deeply into the vitreous body. Perhaps Dr. Gifford's and Dr. Jackson's cases are of a similar, or of a tuberculous nature.

With regard to the question of Dr. Jackson whether what I have described may explain the formation of retinal cysts, I do not really know. All retinal cysts which I have seen have been connected with detachment of the retina. The way in which they were formed was that fluid was retained between retinal folds which were crowded together; later the walls of such a cyst gradually become thinner, and several smaller cysts may coalesce to form larger ones.

The unpigmented, round cell sarcoma in a child, referred to by Dr. Smith, is not new. I have seen and published two such cases. In both cases the tumor sprang from the deeper parts of the ciliary body and grew into the anterior chamber through the meshes of the ligamentum pectinatum.

SAMUEL SHARP, THE FIRST SURGEON TO MAKE THE CORNEAL INCISION IN CATARACT EX- TRACTION WITH A SINGLE KNIFE. A BIOGRAPHICAL AND HIS- TORICAL SKETCH.

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IN reviewing the history of the modern operation of extraction of cataract, beginning with the first memoir of its originator, Jacques Daviel,* first read before the Royal Academy of Surgery of Paris, on April 13, 1752, there stands before us a singularly prominent and imposing figure, that of Samuel Sharp, of London. He was a surgeon of renown, and not only did much to advance his art in general, but he also did important pioneer work in the treatment of diseases of the eye, particularly that of cataract. The latter alone, was of such signal benefit to the world that it crowns his memory with an imperishable lustre.

*For a history of Daviel's operation see a paper by the author entitled *Jacques Daviel, and the Beginnings of the Modern Operation of Extraction of Cataract* (Journal of the American Medical Association, July 26, 1902).

Sharp was born about the year 1700, on the island of Jamaica, one of the English possessions of the West Indies at that time as well as now. His family identity has not been recorded, but he evidently belonged to those Sharps of England who have for two or more centuries been found among her most distinguished men of letters, art and science. I am unable to find any history of the early life of Samuel Sharp. As his later life shows, he undoubtedly received a substantial education, for he wrote well, talked well, and was more or less familiar with the ancient and modern languages, having good command, especially, of French and Italian.

We come in direct touch with Sharp first, in 1724, when he was twenty-four years old. He was at this time about to prepare himself for his life-work as a surgeon. This was not done then as it is now. He was living in a different age, with different standards and amidst different surroundings. The medical profession in England had not yet outgrown mediæval ideas and customs, and it was divided into three classes, the physicians, surgeons and apothecaries, each one with its special functions and limitations. The physicians dominated, more or less, the other two classes. They were educated at the universities in accordance with the standards of the time, and occupied a dignified position in society. Very few of them "stooped" to do surgical work, most of them engaging only in the practice of "internal medicine," in obedience to the traditions of the past, when it was regarded as beneath the station of the physician to take to himself the menial labors of a handicraftsman like those of the apothecary and surgeon. On the other hand, the surgeons and apothecaries were not, in general, the learned men of the universities, but were craftsmen under the control of their guilds or "companies," acquiring their mastership and "freedom" through a stipulated term and condition of service, like any tradesmen. The surgeons, in 1724, had their "United Barbers' and Surgeons' Company" which had been incorporated by parliament, in 1540, in the reign of Henry the VIII. and which was the outcome of the union of the "Gild of Barbers," whose members did surgery as well barbery, and of the "Gild of Surgeons," of London. Both of these "companies" had existed as separate bodies for a very long time. The "United company" was organized for

the purpose of assembling together, in order that "the good and due order, exercise and knowledge of the said science or faculty of surgery shall be rendered more perfect, as well in speculation as in practice, both to (the members) themselves, and all their servants and apprentices brought up under them, * * * than it hath been, or should be, if the two companies of barbers and surgeons should continue severed asunder, * * * as they before this time have been, and used themselves not to meddling together" (The Craft of Surgery, by South and Power, London, 1886, page 100). The members of the company, however, were directed by the act that "No manner of person within the city of London or the suburbs thereof, or within one mile compass of the same, after the feast of the Nativity of our Lord God next coming using barbery or shaving * * * neither he nor they nor none other for them to his or their use shall occupy any surgery, letting of blood, or any other thing belonging to surgery, drawing of teeth only except(ed). And in like manner, whosoever useth the mystery or craft of surgery, shall in nowise occupy nor exercise the feat or craft of barbery or shaving, neither by himself nor by none other, for him to his or their use" (Craft of Surgery, page 101). Thus were the limitations of the barbers and surgeons for the first time fixed and defined, and although united in a body for certain defensive and municipal purposes, the barber was to do nothing pertaining to surgery, except to "draw teeth," and the surgeon was not to perform any work of "barbery" or "shaving." This union would seem to be anomalous and undesirable, but it appeared to prosper and meet the needs of the community, until 1745, over two centuries, when a separation again took place, and the surgeons were organized into the "Surgeons' Company," afterwards the College of Surgeons of London, now the Royal College of Surgeons of England, and the barbers continued as before.

In the United Company was vested the power of regulating, more or less, the practice of surgery, and it was the main channel leading to security and respectability for the surgeon. London was full of unlicensed practitioners and quacks, but both the College of Physicians, which had been

founded in 1518, and the United Company did all in their power to suppress them.

To become a recognized and respectable surgeon, the candidate must have served an apprenticeship of seven years, passed certain examinations, paid certain fees, and made solemn oaths of loyalty and obedience. Having been granted the diploma and "freedom" of the company, he was required to continue his relations to the company, perform prescribed duties in its behalf and attend the lectures and demonstrations given at the Barber-Surgeons' hall or, in default of this, pay a fine.

To become a surgeon the candidate, who should be at least fourteen years of age, was taken to a member of the Barber-Surgeons' Company who was in need of an apprentice, (each master being allowed to take three or four, according to his position in the company), and having agreed upon the terms of his acceptance, he was sent to the Barber-Surgeons' hall and duly presented to the court or council of the company and there examined as to his soundness of "mind and limb," and as to a sufficiency of education. If he were approved, the clerk of the company made out his indentures, which were taken to the guild hall and there registered. The lad was bound to his master for seven years (sometimes for eight or nine years). The master received a sum of money agreed upon, in return for which he undertook to supply his apprentice with "meat, drink, apparel, lodging, and all other necessities according to the custom of the City," and to instruct him in the "mysteries" and knowledge of the craft. During the time for which he was bound, the apprentice remained the slave of his master (D'Arcy Power in "How Surgery Became a Profession in London," reprint from *The Medical Magazine*, London, 1899, Page 25).

In compliance with these requirements, Samuel Sharp was "bound" to William Cheselden, of London, one of the greatest surgeons of modern times. He had taken up his residence in England, but whether with or without his parents is not recorded. His indentures were for an apprenticeship of seven years, and were signed on March 2, 1724. It appears that friends were assisting him in his new undertaking, as the fee of three hundred pounds sterling (\$1,500.00), was paid by Mrs. Elizabeth Sale, "a widow living in Hert-

ford." Just how Sharp was employed or what studies he engaged in during his apprenticeship can only be conjectured. There is reason to believe, however, that his master had great regard for him and gave him the best advantages of the time. Cheselden (born Oct. 19, 1688, died April 10, 1752), himself, coming from a wealthy family, had had an excellent training. He had a classical education, and had been the house-pupil of William Cowper, the anatomist. Moreover, he was highly endowed intellectually, and was a man of great energy and high ambition. As soon as he had obtained the "grand diploma" of the Barber-Surgeons' Company, in 1711, he began lecturing on anatomy. These lectures were delivered at first, perhaps, at the Surgeons' Hall, where a lecturer was, by special permission, allowed to teach a small class, after he had performed his public duties, and from time to time, as opportunity occurred, "a private anatomy was wrought upon" (Power, reprint cited, page 29). These lectures were continued at his house, and afterward, for twenty years, at St. Thomas' Hospital, to which he was appointed in 1719. The lectures were on anatomy, and were published in book form in 1713. This work afterward passed through many editions. Besides his appointment at St. Thomas', he was surgeon at the Chelsea Hospital, and on the foundation of St. George's, in 1733, he was appointed one of its surgeons. Besides his hospital appointments he was made surgeon to Queen Caroline, in 1728, and by his many talents became a welcome guest in the highest social and literary circles. He was a member of the Royal Society, and was an intimate friend of Alexander Pope, the poet, Jonathan Richardson, the painter, and Sir Hans Sloane, the naturalist and founder of the British Museum. Such being the activities and relations of the master, naught but intellectual and social advantage could accrue to the favorite pupil. Undoubtedly, Sharp had the opportunity of attending Cheselden's anatomical lectures, and also of seeing his extended hospital work and assisting in it. It was at about this period (1723-1727), that Cheselden was studying and perfecting his operation of lateral lithotomy, which he executed with such extraordinary skill, brilliancy, and success, even on one occasion extracting a stone from the bladder, it is said, in fifty-four seconds. He became so famous in his operation,

that surgeons came from all over Europe to witness his performance of it, and to learn his method. The French Academy of Sciences became much aroused over the operation, and delegated M. Sauveur-François Morand, one of its distinguished members, to go to London, and study it. This visit led to a lasting friendship between the two great surgeons, the fruits of which were an advancement, by interaction, of both English and French surgery to an extent that never can be measured. The interchange was such that all that was best in England went to France, and all that was best in France came to England.

Sharp was at this time presented to Morand while he was in London, and through this acquaintanceship he afterward went to Paris to study surgery even before he had completed his apprenticeship with Cheselden. More than this, Morand later became the warm friend of Sharp, and did much to promote his interests, as well as those of Cheselden, in the Royal Academy of Surgery of Paris, of which both became members, Cheselden, in 1743, and Sharp, in 1749.

Not only did Sharp have the benefit of the acquaintanceship of Morand and other French surgeons, but he counted it one of the privileges of his life to know the celebrated Voltaire and to have social intercourse with him. This acquaintanceship began while Voltaire was living in London during his exile from France, in 1726-1729*, and was continued in Paris, as Sharp was frequently the guest of Voltaire while he was studying surgery there, probably in 1730, as well as later in life.

With all the opportunities which Cheselden was able, and undoubtedly disposed to give his pupil, and with all the advantages which were to be derived from the work and standing of the master, Sharp made creditable progress in his studies, and on March 7, 1731, was admitted "freeman" of the Barber-Surgeons' Company. Imbued with the spirit of his master, his ambition led him to go farther, and after

* "I knew him in the days of my youth, and had the honor to be sometimes with him when he was in London. I also saw him in Paris in 1749. . . . I remember to have heard him say, about the year 1726, that before he learnt English he read the *Spectators* in French and often wondered that such dull writings should please a polite nation. 'But now,' said he, 'that I have acquired the tongue,' etc." Sharp's "Letters from Italy", Second edition, pp. 2 and 4.

practicing a year and demonstrating to the Company his high proficiency, he was granted the "grand diploma", which entitled him to be called a master in surgery and anatomy, and allowed him to practice his art anywhere and during his whole life (Power, reprint cited, page 26). This diploma was obtained on April 4, 1732, and on June 6, the same year, he "was admitted into the livery and clothing of the Company."

Thus did Samuel Sharp prepare himself for his chosen calling and equip himself for its duties. Ambitious, intelligent, energetic, he made the most of the opportunities which his great master had offered him, and began the practice of surgery under auspices most favorable to success. Cheselden's friendship was so great for the man who had assisted him so materially in his lectures, in his operations, and in preparing and publishing those plates of such extraordinary beauty and excellence, comprised in his famous work known as "Osteographia," that his kind offices in Sharp's behalf did not cease when he was no longer his master, but they were continued for many years afterward. In many ways was Cheselden's powerful influence cast for Sharp. This was especially notable in the year 1733, the year of the publication of Cheselden's "Osteographia," and did much to give Sharp a foothold on the surgical practice of London that was sure, and to secure a start in a career that became distinguished and productive of great professional good.

Guy's Hospital had been opened in 1725, and its administration had been patterned largely after that of its more ancient neighbor, St. Thomas'. The medical and surgical staffs of both institutions, also, were so closely related that for many years they were practically one. The first surgeons appointed to Guy's were Francis Croft and Andrew Cooper. Croft resigned in 1727 and Robert Baker succeeded him. Cooper resigned in 1732 and Hasell Cradock was appointed to his place. Baker served the hospital four years, retiring in 1733. Here was an opportunity for Sharp, and both he and Cheselden, then of St. Thomas', saw it. Sharp had been practicing two years and was now in position to assume hospital responsibilities on his own account, and he desired the place made vacant by Baker's resignation. Cheselden's influence here became paramount, and Sharp was elected

surgeon to Guy's on August 9, 1733, in association with Cradock. This association, however, was of rather short duration, as the latter died in 1736. John Belchier, a friend of Sharp, about four years his senior, and also an apprenticed pupil of Cheselden, was appointed to Cradock's place. Sharp and Belchier remained colleagues in the hospital until 1757, when Sharp resigned. Belchier, who was a man of some note, did not retire till 1768.

From the moment of Sharp's appointment to the hospital in 1733, his practice began to grow, and it rapidly increased till soon it became large and lucrative. Following the example of Cheselden, he instituted a private course of lectures to a society of navy surgeons, which he delivered in Covent Garden. Such lectures were somewhat of an innovation on the customs of the time, but they were accepted and tended to increase Sharp's popularity. They constituted a "course of anatomical lectures to which were added the operations of surgery with the application of bandages." In 1746 he was so much occupied by the increase of his work that "for want of leisure" he resigned his lectures to William Hunter, then a surgeon, who continued them, and in whose hands they became the nucleus of that celebrated school of medicine of the eighteenth century, known as the "Great Windmill Street School," which is thought by some to have laid the foundation of modern medical teaching.

Soon after Sharp's appointment to Guy's Hospital, he received an apprentice whose relations to him and to the hospital proved of great service both to himself, the hospital and the profession. This apprentice was Joseph Warner, who, like himself, was born in the British West Indies, in Antigua, and from there was sent to London to be educated. In 1734, at the age of seventeen, he was bound to Sharp. He was at once allowed to assist his master at Guy's, and to attend Sharp's lectures on anatomy and surgery. Having finished his apprenticeship and entered into the practice of surgery, a vacancy occurred in the hospital staff by the death of James Pierce, in 1745, who had just been made its third surgeon, and he was appointed to his place. By this appointment Guy's had three surgeons, all of whom honored the institution and distinguished themselves. These were Sharp, his fellow apprentice under Cheselden, Belchier, and his own

pupil, Warner. With such men as these in the surgical department, it is no wonder that Guy's Hospital rapidly rose to the first rank among the hospitals of London. Sharp's pupil, moreover, carried forward those innovations and improved methods which Sharp had introduced, and thus perpetuated the results of his labors.

In the course of time, Sharp had so far risen in the esteem of the learned of London that he was deemed a worthy candidate for fellowship to that very exclusive and select body of savants, the Royal Society, and in 1749 he was taken into its fold. During the same year he made another visit to Paris, where he was received with open arms. Here he studied, carefully, the latest methods and improvements of the French surgeons, and at the same time was honored by being elected a foreign member of the Royal Academy of Surgery of Paris, another body of limited and select membership. Here his acquaintance and friendship with Morand, the perpetual secretary of the Academy, proved of signal service. On his return to England he wrote a book, "*A Critical Enquiry into the Present State of Surgery*," in which he reviewed contemporary practice and embodied his observations on the practice of the surgeons whom he had met.

Sharp's practice in London now assumed very large proportions. The demands which were thus made upon him, together with a life-long affliction of asthma, induced him, after twenty-four years' service, to relinquish his hospital work. He tendered his resignation to Guy's on September 23, 1757, but continued to practice until 1765, when, on account of ill health, he went to Italy, where he spent a year in travel. While in Italy he wrote a series of letters, fifty-four in all, to a friend in England, describing the manners and customs of the inhabitants of the various provinces which he visited, and giving his impressions of them. These letters, even to-day, are deeply interesting, and at the time of their publication in book form, in 1766, and a second time in 1767, they aroused a good deal of feeling among the Italians.* Barretti, in answer to Sharp, published a work

* Dr. Samuel Johnson, the learned contemporary of Sharp, said: "I read Sharp's letters on Italy over again when I was in Bath. There is a great deal of matter in them."—*Boswell's Life of Johnson*, by Crocker, page 512.

in two volumes entitled "An account of the manners and Customs of Italy," which passed through two editions. In this he criticised Sharp severely. In 1768 Sharp defended himself in another publication which he entitled "A View of the Customs, Manners, Drama, etc., of Italy, as They Were Described in the 'Frustra Litteraria.'" In this Sharp unearthed a number of contributions by Barretti, containing similar censures to his own. It is generally conceded that Sharp did not in the least exaggerate the condition of the people with whom he came in contact, and that the honors of the controversy fell upon him.

Before the publication of his "Letters from Italy," and the book in answer to Barretti, Sharp had made important contributions to the professional literature of his day. His first book was issued in 1739, and was undoubtedly the outcome of his series of lectures to navy surgeons already referred to. It was entitled "A Treatise on the Operations of Surgery, with a Description of the Instruments Used in Performing Them: To which is Prefixed an Introduction on the Nature and Treatment of Wounds, Abscesses and Ulcers." He dedicated his work to William Cheselden, his teacher and friend, as follows: "As I am chiefly indebted to the advantage of an education under you, for whatever knowledge I can pretend to surgery, I could not in the least hesitate to whom I should dedicate this treatise: though was it my misfortune to be a stranger to your person, that merit which has made the world so long esteem you the ornament of your profession, would alone have induced me to show this mark of my respect, which I hope will not be unacceptable."

In his preface he says: "It has been very much my endeavor to make this treatise short; and therefore I have given no histories of cases, but where the uncommonness of the doctrine made it proper to illustrate it with fact, and these I have recited in the most concise manner I was able. On this account, too, I think I have not attempted to explode any practice which is already in disrepute." In following out this plan of limiting himself to the statement, in as few words as possible, of the "distinguishing appearances" of surgical diseases, and the methods of treatment which he approved, he gave to the profession a most acceptable treatise. The

first edition of 1739 was followed by a second in 1740, and in 1782 there had been ten English editions, and one in French, in 1741.

Sharp's next literary undertaking was his "Critical Enquiry into the Present State of Surgery." He published this in 1750, soon after his visit to Paris in 1749. In this work he says in the preface, "I have only considered either such doctrines which, though generally received, are in my opinion ill-grounded, or such improvements as are yet little known." In this "Enquiry," there are over three hundred pages of "criticisms" on the surgical practices of the time, particularly of the Parisian surgeons, together with statements of his own conclusions and methods. This book, like the previous one, was concisely and clearly written, and was well-received, both by the English and the continental profession. It passed through four English editions up to 1761, and translations of it were made into French, in 1751, into Spanish, in 1753, into German, in 1756, and into Italian, in 1774.

Besides these works on general surgery there were published three papers which Sharp read before the Royal Society of London. The first one was very brief, and was on "Experiments Concerning the use of Agaric of Oak in Stopping of Hæmorrhage," and was read December 14, 1752, and published in the Philosophical Transactions, Volume XLVIII, Part II, for the year 1754 (London, 1755, page 588). The second paper was also brief and was read before the Royal Society on April 12, 1753, and was entitled "A Description of a New Method of Opening the Cornea, in Order to Extract the Crystalline Humor." It was published in Volume XLVIII, Part I, for 1753, of the Philosophical Transactions, London, 1754, page 161. On November 22, 1753, he read another paper before the same body on the same subject entitled, "A Second Account of the New Method of Opening the Cornea, for Taking away the Cataract." This was also published in Part I, of the same volume, page 322.

Sharp, it appears, did not practice long after his return from Italy in 1767, but, having acquired a large fortune by his profession, and being a chronic invalid, retired at about that time or perhaps soon afterward. He lived, however, to

an advanced age, dying on March 24, 1778, nearly eighty years old.

Not only was Sharp recognized as a great and skillful general surgeon, but he took highest rank as an ophthalmic surgeon. His services were sought by all classes afflicted with diseases of the eyes. The celebrated Dr. Samuel Johnson, of his time, typifies the confidence that was thus reposed in him. His friend, Mrs. Anna Williams, had cataracts, and at his request Miss Hawkins took her to Sharp (in 1751) who had said he "would couch her gratis, if the cataract was ripe; but upon making the experiment it was found otherwise and that the crystalline humor was not sufficiently inspissated for the needle to take effect" (Foot-note to page 74, Boswell's *Life of Johnson*, by Croker). Again, in a letter dated October 18, 1760 (same work, page 121), Johnson says: "I am very solicitous for the preservation or curing of Mr. Langton's sight, and am glad that the surgeon at Coventry gives him so much hope. Mr. Sharp is of the opinion that the tedious maturation of the cataract is a vulgar error."

In taking special notice of Sharp's contributions to ophthalmology, we find that they were not numerous, but that they were important as bearing upon the opinions and practices of the time, especially those pertaining to the extraction of cataract. The true nature of cataract had become generally recognized long before Sharp began his rôle as an author. This knowledge, however, had not changed its treatment, and couching was still accepted as the standard operation when he wrote his "Operations of Surgery." This operation he himself practiced and described, and he offered some suggestions as to how it might be improved. The chapter embodying this description also gives the symptoms, diagnosis and varieties of cataract, clearly, and for the most part accurately, excepting that he said that "the glaucoma was no other disease than cataract." He took cognizance of the complications and sequelæ that followed the operation, and among them the closure or obscuration of the pupil. He had become familiar with the operation for making an artificial pupil in such cases, as practiced by his master, Cheselden, and as described and published by the latter in the *Philosophical Transactions*, Vol. XXXV, 1728, page 451. In his

“Operations of Surgery,” Sharp gives an entire short chapter to “Cutting the Iris,” and details Cheselden’s operation, adding such improvements as he had devised. He notes the conditions in which the operation “may be of some service,” and says that one is “when the cataract is from its adhesions immovable; and the other when the pupil of the eye is totally closed up by a disorder of the muscular fibres of the iris, which, gradually contracting the orifice, at least leaves the membrane quite imperforate.” In doing the operation, he seated the patient in the same way as for couching, and used a knife resembling a narrow lancet, with two edges. This knife being introduced “in the same part of the conjunctiva you would in couching, insinuate it, with its blade held horizontally and the back toward you, between the ligamentum ciliare and circumference of the iris, into the anterior chamber of the eye; and after it is advanced to the further side of it, make your incision quite through the membrane; and if the operation succeeds, it will, upon wounding, fly open, and appear a large orifice, though not so wide as it becomes afterwards. The place to be opened in the iris will be according to the nature of the disease: if the membrane itself be only affected with a contraction, the middle part of it, which is the natural situation of the pupil, must be cut; but if there be a cataract, the incision must be made above or below the cataract, though I think it more eligible to do it above.” He then pointed out the contraindications for the operation, and the dangers that frequently attend it. In later editions of his “Operations” he said that “since it has been discovered by the extraction of the crystalline (lens) that a large wound may be made through the cornea without any bad consequence, I should imagine this operation would be much improved by introducing the knife perpendicularly through the cornea and iris, and cutting both at the same time, so that the incision of the iris should be exactly in the same part and of the same dimensions as by the other method.”

Thus did Sharp endorse and popularize his master’s operation for artificial pupil, and improve upon it, and thus was strengthened and made more secure the foundation for the modern operations of iridotomy and iridectomy.

Another condition which attracted the close attention and judicious consideration of Sharp was "fistula lachrymalis." It was a disease that had long baffled the efforts of surgeons, and he set himself the task of improving upon the prevailing methods of treating it. His "Operations" contains a long chapter on the subject, and after reviewing its symptoms, "nature," and the usual treatment, he suggests the discarding of "fire" (the actual cautery) "in all the stages of it." He treats it by incising the abscess or "fistula," keeping the sac open by dossils of lint, and probing the nasal duct, through the opening into the sac, at each dressing, and when the suppuration diminishes sufficiently he allows the opening to close by granulation, and by using gentle pressure over the sac by means of a special instrument which he devised for the purpose. When the bone was bare, he used a "perforator," carrying it through the duct well "towards the nose," and then treated the case as before, by dossils of lint, probing, cleansing and, later, compression. This treatment was far in advance of that by the cautery, then so much in vogue.

In 1750, when he brought out his "Critical Enquiry into the Present State of Surgery," he again referred to fistula lachrymalis, and said that "an ingenious surgeon," Monsieur De la Forest, had showed him when in Paris, in 1749, "a new way by which he declares he had cured several fistulæ lachrymales without making an incision into the saccus lachrymalis." This consisted in making injections upward through a canula passed from the nostril through the nasal duct into the sac, or by means of a syringe alone. Sharp found the method difficult to execute.

The next ophthalmic contributions by Sharp were the two papers already referred to which he read before the Royal Society on April 12 and November 22, 1753, respectively, and published in 1754 in the "Philosophical Transactions," as above stated. These papers were on "A New Method of Opening the Cornea" in the extraction of cataract, and in the history of the operation of extraction of cataract have an importance second only to the immortal "invention" of Daviel, the originator of the modern operation. Although they were read in 1753, they were not published till the

following year. Their subject was new among surgeons, and made a profound impression. Daviel's operation was being discussed with much warmth in France, but had received little attention in England. Sharp was always abreast of his time, and as a member of the Parisian Royal Academy of Surgery, and as a personal friend of Monsieur Morand, its perpetual secretary, he very likely knew in the main what was taking place in that progressive body. Daviel's memoir, according to the custom, had been read twice before the Academy, once on April 13, and again on November 16, 1752, and de la Faye, a distinguished French surgeon and a member of the Academy, had also during the winter of 1752-3, soon after Daviel read his paper the second time, presented a knife which he proposed to substitute for Daviel's triangular knives and scissors in making the corneal incision in the operation of extraction of cataract. Daviel's memoir was published in abstract, at the time it was read, in the *Mercure de France*, but de la Faye's suggestion was not made public till late in 1753 or early in 1754, when Tome II of the "*Mémoires de l'Académie de Chirurgie Royale*" was published, and was included in his memoir on extraction of cataract, and must have been after both of Sharp's papers had been read before the Royal Society of London. While, therefore, de la Faye, in November, 1752, had publicly described a single knife for making the corneal incision, he had not then used the instrument on the living subject, and did not do so, as he himself says, until June 11, 1753, when he "performed this operation on six persons" (See de la Faye's Memoir in Tome II of "*Mémoires de l'Académie de Chirurgie Royale*," page 563). It is barely possible that Sharp knew something about de la Faye's knife through Morand, with whom he held correspondence, but this is made doubtful by the fact that in his second paper before the Royal Society (Nov. 22, 1753) he says that Daviel "*is the only writer who has treated the subject (extraction of cataract), at least that I am acquainted with.* I therefore flatter myself that this attempt to improve upon what he has laid down will not be construed as a reflection on him or his practice. For, however his invention may be perfected by others, in my opinion, it is still to him, principally, that the world will be indebted for the benefit of the discovery."

The knife which de la Faye had presented to the Academy was, as he says, "a species of small bistoury, fixed in its handle, its blade very thin, a little convex on its flat, and twenty to twenty-one lines long and two lines wide at its greatest width. It is edged only on one side, except at its point where the back is also edged, but only for about two



FIG. 1.—The knife of de la Faye. The upper line shows the "convexity" of the blade on its flat. From *Mémoires de l'Acad. de Chir.*, 1753, tome II.

lines. The point and the whole edge have the fineness of the point and edge of a lancet. * * * The handle is three inches and nine lines long by four lines in diameter." "The blade is slightly curved on its flat so as to keep the point away from the iris in traversing the anterior chamber" (See Fig. 1).

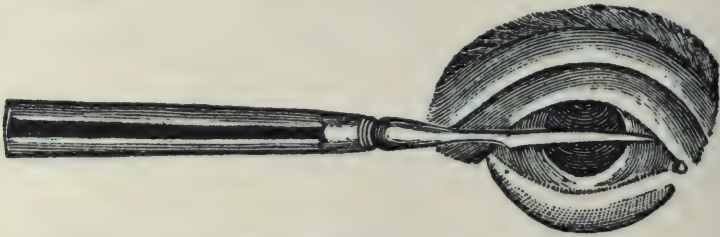


FIG. 2.—Sharp's knife. From original cut accompanying his first paper.

The knife of Sharp had no resemblance to that of de la Faye. It was "a small knife a little larger than an iris knife" (*Critical Enquiry*, third edition, page 252). It was straight on its flat, somewhat convex on its back, slightly concave on its edge, a little less than an inch long, and at its heel about



FIG. 3.—Another illustration of Sharp's knife. From tome II of *Mémoires de l'Acad. de Chir. Royale*, 1753.

one-eighth to one-sixth of an inch wide, tapering gradually to a fine point. It is figured in Sharp's first paper (Fig. 2) and also in Tome II of "*Mémoires de l'Académie de Chirurgie Royale*," 1753, in connection with a figure of the knife of de la Faye (Fig. 3). Sharp first used his knife on April 7,

1753, and before June 11, 1753, when de la Faye first used his on the living subject, he had made seven extractions with it. Previous to Sharp's first operations, no other surgeon had used a single knife for the same purpose, although it was not long afterward when, besides de la Faye, Poyet, a young Parisian surgeon, offered one (Fig. 4) which had little to commend it, and which was never adopted by other surgeons (*Mémoires de l'Académie de Chirurgie Royale*, Tome II, page 353). While, therefore, the priority of suggestion may be claimed to belong to de la Faye, the priority of *use* incontrovertably rests with Sharp. He had, as he says, "used the scissors as Mons. Daviel directs" (second paper, *Phil. Trans.*, Vol. XLVIII, page 327). He experienced the inconveniences of Daviel's multiplicity of instruments. His originality and mechanical turn of mind led him to devise a remedy, and his knife and his operation, both of great perfection, were the result.



FIG. 4.—Poyet's knife. From *Mémoires de l'Acad. de Chir.*, 1753, tome II.

The first paper of Sharp on opening the cornea was very short, and is worthy of further record at this time. As originally published in the *Philosophical Transactions* (Vol. XLVIII, page 161), it was as follows:

"The operation of discharging the crystalline humor from the eye, for the cure of that species of blindness called a cataract, was a few years since invented by M. Daviel, who has performed it on great numbers of patients, and continues still to practice it with remarkable success, as I have lately learned from unquestionable authority (M. Morand, perpetual secretary of the Academy of Surgery at Paris). Supposing it therefore admitted, that the extraction of the crystalline humor has been found by experience to be a useful method of cure, I here take the liberty of laying before the Society a new manner of making the incision of the cornea, by which, I flatter myself, M. Daviel's operation will be very much shortened, the patient will suffer less pain, and every skillful operator will be equal to the undertaking.

"Place the patient in the same situation as for couching,

either opening the eyelids with your forefinger and thumb, or letting an assistant raise the upper eyelid, while you yourself keep down the under eyelid. Then, with a small knife, the figure of which is here represented (Fig. 2), holding its edge downwards, make a puncture through the cornea near its circumference into the anterior chamber of the eye, in such a direction, as to carry it horizontally, and opposite to the transverse diameter of the pupil: after which you are to pass it towards the nose, through the cornea from within outwards, as near to its circumference as in the first puncture.

“When you have made the second puncture, push the extremity of the blade one-seventh of an inch beyond the surface of the cornea, and immediately cut the cornea downwards, drawing the knife towards you as you make the incision. After this, you press gently with your thumb against the inferior part of the globe of the eye, in order to expel the cataract, and the operation finishes, according to the different circumstances, as in the manner proposed by M. Daviel.

“One extraordinary benefit seems to arise from the use of this single instrument, and perhaps from the shape of its blade, which increases in breadth all the way towards the handle; for, by this means, the punctures are so exactly filled up by the blade, that very little of the aqueous humor is discharged before you begin to make the incision, and consequently during this time, the cornea preserves its convexity; whereas by using one instrument to puncture, and others to dilate, the cornea immediately becomes flaccid, upon the issue of the aqueous humor, and renders the operation tedious and embarrassing, as I myself have found by experience in one patient, on whom I performed the incision of the cornea with a pair of scissors, as recommended by M. Daviel.”

This contribution needs no comment. It is one which not only exemplifies Sharp's incisive and comprehensive manner of expression, but in its subject-matter and surgical procedure is an epoch-making document. It gives recognition to the value of the great “discovery” of Daviel, refers to its drawbacks, and describes his own method of remedying them. His new experience was slight, but his surgical sense and genius had elaborated almost a model operation. It was in fact, even in its beginnings, the same incision as is made to-

day, being directed downward, instead of upward, as Schweigger and others still prefer to do in many cases.

Sharp's second paper is a continuation and augmentation of the first, and embodies the records of all the cases upon which he had operated with the knife, and the conclusions which an increased experience had suggested to him. As already noted, this paper was read November 22, 1753, and up to this time he had undertaken to make nineteen extractions. These were done between April 7 and October 22 of that year. After listing them he says: "The state of the success stands thus: AC, AD, AF, AG, AL, all of which had the operation performed on both eyes, have every one of them recovered the sight of both eyes, to as great a perfection as can be supposed, without the help of the crystalline humor; that is, they can read and write with proper spectacles. The first of them, AC, has found so much benefit, as to be able to carry on the exercise of his profession, that of a surgeon.

"AH sees with both eyes, but not so well as the other five. I have just now an account from the surgeon, who has attended her (in a distant country), that her eyes look well and her sight improves.*

"AI, another patient at a distance from London, had the operation done on one eye only; which he recovered, as my correspondent informs me, so as to see tolerably well. AM, on one eye only, with which he already sees very well. AE had it performed on both; one of which was lost, and the other recovered; but continues inflamed, and cannot bear much light. AB had it done on one eye only, which was lost.

* * * The ill success was partly owing to the imperfection of my instrument, a disadvantage that must frequently attend on the execution of new attempts. It was the first operation I performed, and I had provided a knife with so thin a blade, that, after I had passed through the cornea into the anterior chamber of the eye, the point was so blunted, that, upon endeavoring to carry it through the cornea out on the other side, the blade bent, and I was apprehensive it

* Some weeks after this paper was read. Mr. Sharp received an account that the pupils of both eyes had lately contracted so much as hardly to leave room for the admission of light, and it was apprehended the patient would soon become blind.

might break. However, withdrawing it a little, I made two or three efforts, and succeeded in the incision, and the removal of the cataract. During this operation, the aqueous humor being discharged, and the patient struggling, I wounded the iris, which bled profusely, and continued several days to discharge a great quantity of blood and bloody ichor; and it is to this accident that I am inclined to impute the miscarriage of the operation."

In the case of AK, there was "the appearance of a beginning cataract, being of a light blue, and but little opaque." Sharp attempted to extract both lenses but failed in each, even after cutting through the capsule with the point of his knife, and subsequently passing the curette "through the pupil and turning it several times round in the expectation of breaking the capsula," but without "the least resistance." "Both operations proved ineffectual, the circumstances being exactly the same in each eye." The lenses receded into the vitreous humor, and much of the latter was discharged.

Thus out of the nineteen eyes operated upon, thirteen results were good, two were questionable, the sight at first being good, but deteriorating later, and four were failures, one of these following an accident with the knife, one from inflammation, and two from inability to extract the lenses. Extraction was really made in seventeen eyes, and two of these were lost. In a new field like this, such a result can but be looked upon as a great surgical triumph. Sharp operated without fixing the eye, without any form of speculum, and delivered the lens without opening the capsule. In one case, however, AC, the lens "from mere pressure in the operation, burst out of its capsula, which I left in the eye; but in some weeks it entirely wasted." In his first operations he delivered the lens by compressing "the inferior part of the globe of the eye with his thumb gently." But noticing that some force was required to expel the lens and that "it sometimes suddenly drew after it a portion of the vitreous humor, I changed my method, and no longer pressed the eye when once the crystalline was in the anterior chamber, but immediately stuck the point of my knife into the body of it, and extracted it contained in its capsula, without spilling any of the vitreous humor. This new process, I

suppose, will be found of considerable advantage as it will, in a great measure, remove the danger of evacuating the whole or too much of the vitreous humor; though it may be observed, to the praise of this operation, that, contrary to expectation, a large quantity of this humor (perhaps a third part or more) has sometimes been discharged without any bad consequence." This new procedure would also, he thought, do away with the difficult and, to the patient, "fatiguing" method of Daviel in which he "advises the flap of the cornea to be suspended with a small spatula, then with a pointed, cutting needle to wound the surface of the crystalline; after which to introduce the same spatula through the pupil in order to detach the cataract from the iris, and then proceed to the expulsion." Sharp believed it better to remove the capsule with the lens, although not absolutely necessary. If in the future its removal should be found necessary, he thought it might be done with Daviel's curette. "This instrument may also be used for the extraction of a cataract which has been broken to pieces by the couching needle in a former operation," as well as for detaching adhesions of the iris to the lens.

In regard to the speculum, he said: "I should not be surprised if the use of a *speculum oculi* should hereafter be esteemed an improvement; but then it must be contrived so as that it shall not compress the globe of the eye; or, if it does, the operator must be careful to remove it the instant the incision is making, lest by continuing the pressure after the wound is made, all the humors should suddenly gush out."

In none of his cases, "either during the operation or after the operation," had the iris "been pushed forwards, or insinuated itself through the wound of the cornea, forming a staphyloma," such as Daviel had met with. In all of Sharp's cases he thought there was inflammation. He regarded this as being due to incision of the cornea, and contrasted it with the great number of cases of couching in which there was neither pain nor inflammation. The inflammation, however, in his extractions was not always severe, and while characterized by tenderness, pain was generally absent, even when there was swelling of the lids and con-

junctiva. "None suffered very much in particular, except AE, who was extremely bad, and lost the eye on the left side, where the pain was."

Sharp was not oblivious to cases of cataract which were not suitable for operation, and called attention to the "possibility of an incomplete gutta serena being complicated with cataract. * * * When a cataract is thus circumstanced, the operation will be fruitless."

After thus detailing his experience and adding suggestions, he says: "I presume a greater number of operations will prove this account very deficient; but I have here communicated all that I have done, and all that I know on the subject, not having suppressed one experiment, nor, to the best of my remembrance, one circumstance, either to the honor or disgrace of the operation."

Sharp not only showed and demonstrated his instrument at home, but also during the summer of 1753 sent one to his friend, Morand, at Paris, who exhibited it to the Parisian surgeons interested in the subject, and inserted a cut of it in the "Mémoires" of the Royal Academy of Surgery, with one of de la Faye (Fig. 3). In Paris it was respectfully received, and his device and experience were a great stimulus to the appreciative minds of the Frenchmen.

In 1754, when the third edition of Sharp's "Critical Enquiry" was called for, he again took up the operation of extraction of cataract, and set apart a whole chapter to the subject, embodying the substance of his previous papers, with such additions as seemed to be justified by his continued experience. He opens the chapter by stating that a new method of treating cataract had lately been attempted by Daviel, of Paris, which had been attended with considerable success, but that he employed a great number of instruments. "As," he says, "his method seems capable of great improvement by being rendered more simple, I have abridged it, and practiced it myself upon several people." He then proceeds to describe his own operation, and the difficulties and complications attending it. In some respects he added very materially to what he published in his papers read before the Royal Society. His further experience had given him clearer notions both of the manner of performing the operation and

of the conditions of healing. The whole chapter merits the attention of the ophthalmological historian, but the following extracts are of most interest. After repeating the description of the operation substantially as given in his first paper, the incision being placed in the lower half of the cornea at its "circumference," he says: "This wound will be almost semi-lunar, and nearly parallel to the inferior half of the circumference of the pupil, so that the cicatrix will obstruct the light but very little. M. Daviel recommends an incision of nearly two-thirds of the circumference of the cornea, but I believe what I mention will be found more commodious, and so large a wound as he directs is apt to give issue to the vitreous humor." In regard to the escape of the vitreous humor and its management he suggests that "it might be owing to a convulsive contraction of the muscles surrounding the globe of the eye during the operation. When this is the case the surgeon must instantly shut the eyelid to prevent the total evacuation of the vitreous humor, and at the same time both he and the assistant cease to press upon the eyelids. But if the crystalline (lens) does not immediately rush out of the eye, the operator must press gently with one or two fingers against the inferior part of the globe, till the crystalline advances through the pupil into the anterior chamber from whence it will generally fall through the wound of the cornea upon the cheek. However, should it not readily fall out of the eye, but remain lodged in the anterior chamber, I would advise the operator not to press the eye in order to expel it, but immediately to stick the point of the knife into the body of it, and extract it contained in its capsula." He laid much stress on this maneuver and enlarged upon the benefits to be derived from it, as in his second paper before the Royal Society. Sharp continued to advise the removal of the cataract with its capsule, but if this were not always practicable, he believed that the capsule "probably will waste; for in milky cataracts, when the fluid is discharged, the membrane at length wastes." Further on, however, he modifies this statement by saying "that probably one cannot always certainly judge at the time of the operation, whether it (the capsule) be taken away or whether it remain; for I suppose that the membrane at the time of the

operation may be transparent and afterwards become opaque, and if this conjecture be well grounded, the operator will not be able to discern it, though it should remain. * * * However, it is a matter of no consequence, whether the remaining capsule be discernable or not, if it be disposed to waste afterwards, as my experience hitherto has proved it." It is now known that Sharp was mistaken in this, as the capsule does not absorb. Sharp further argues for the use of the curette "in removing the capsule," both after the ordinary extraction, and after the fluid of a "bag-cataract" has been discharged, and also in "detaching the crystalline from the back of the iris, when any portion of it happens to adhere, which circumstance would render the operation fruitless without such a precaution." Again the curette is useful in "taking away the fragments of a cataract when in pieces."

The proper length of the corneal incision had become a matter of great concern in Sharp's later experience. "If it be too large," he says, "all the humors are subject to be voided; if too small, the aqueous and vitreous will rush out upon pressure, and the crystalline will remain behind * * * It is, therefore, a precaution of the highest importance not to exert much force in pressing the eye after you discover that the incision of the cornea is too small, but in that case to enlarge the wound sufficiently with a convenient pair of scissors, and then proceed to the expulsion of the cataract. Could we safely make use of a *speculum oculi*, perhaps this difficulty in making a proper incision of the cornea might be diminished; and I am inclined to think that with due attention it might be employed; but then it must be contrived so, as that it shall not compress the globe of the eye," repeating his former statement in regard to it. Speaking further of the incision he says: "A man that practices the operation on a dead body will wonder at the difficulty I have supposed in making this incision; but when an eye is in a convulsive motion, and the eyelids are almost shut, as it often happens in the operation, the case is very different. The most material instruction I can give on this head is to make the first puncture through the cornea with quickness; because when your knife is once through the cornea, it gives you some command of the motion of the eye; but if you attempt to

penetrate the cornea gently and gradually, the eye, upon the first sensation of the puncture, will suddenly retire from the knife, and the operator will be apt to carry it betwixt the laminae of the cornea, or through the cornea upon the iris, either of which accidents would incommode, if not defeat, the operator."

He again refers to accidents and sequelæ and repeats that he has not had protrusion of the iris through the wound as had happened with Daviel who said "it may easily be replaced by the spatula." "It seldom or never happens that the patient escapes an inflammation in this method of removing the cataract." Here, probably, Sharp mistook the reaction which normally follows an operative traumatism for an undesirable pathological process. In some of his cases, however, the inflammation undoubtedly exceeded the "normal" limits. In his opinion, "there is one great evil to be apprehended from a violent and tedious ophthalmia after this operation, and that is, an inflammation of the iris, which I have seen in two patients bring on such a contraction of the pupil, as in time to close it, and have no passage for the admission of light. Some alteration in the shape of the pupil after this operation is exceedingly common; but the mere loss of its circular form is no impediment to the sight. This change of figure in the pupil is supposed to be owing, either to its sudden dilation from the rapid motion of the cataract, when expelled, or to some violence done to it by the knife during the operation; but it is not improbable that the inflammation of the iris may also sometimes produce this effect."

Thus did Sharp, conscious of the advantage of the extraction of the cataractous lens from the eye, and appreciating the value of the essential principles of Daviel's method, give to the world with the utmost candor and humility the facts and results of his experience in a new field of surgery. He had established a great improvement on the beneficent "discovery" of Daviel. Through the *Philosophical Transactions* and his "Critical Enquiry" it was promulgated to the English speaking world, and through Morand it was made known to France. The greatest interest pervaded professional circles both in England and on the continent, and im-

mediately did the strife begin to invent a knife of best form and size with which to incise the cornea, and to take the place of Daviel's "needles" and scissors. After Sharp and de la Faye's knives, came those of Poyet (1753), la Haye (1755), Bérenger (1756), Tenon (1757) and Pamard (1759), in France, and of Warner (1754) in England, and Thomas Young (1756) in Scotland. Heated discussions arose regarding the comparative value of the different methods of extraction and of the instruments used, and also over the question as to whether couching or extraction yielded the best results. The controversy regarding instrumentation is not closed yet. But the operation of extraction long ago took the supremacy, and in its simplest form it had its beginning with Samuel Sharp, the London surgeon. In the capacity of originator he stands but little below the immortal Daviel himself. With an insight, genius and skill seldom if ever surpassed, he took Daviel's gift, and without other guide or compass, brought the operation of extraction, even in the face of inherent obstacles and difficulties, to a perfection which challenges the most profound admiration. He used the single knife, the form of which was such as might be successfully used to-day, his corneal incision was in accordance with the best notions of the most skillful operators of the present time, except that it was downward instead of upward; he did not excise a portion of the iris, and he endeavored to remove the lens in its capsule, a desideratum still desired by many. He foresaw the needs of the operation, and hinted at improvements which have since been adopted. He was mistaken in a few things, but for the most part he was right. He proved himself a great leader, and, figuratively speaking, he took Daviel by the hand and championed a cause which secured one of the greatest triumphs of modern surgery.

Such, then, is something of the life and work of one of England's greatest surgeons. In brief, he had great originality, clear insight, and his moral character was unimpeachable. His writings were characterized by clearness, brevity and simplicity, a style which England lacked at that time. He was an enemy to the mania for authority, and was hostile to routine. His originality, independence and mechanical talent left their impress on all he said or did. There were

few surgical diseases on which he did not put forward new ideas, and in none did he effect such great advancement as in cataract and its treatment. Few, also, were the operations whose instruments or procedure he did not improve. Sir James Paget said: "He was a thoroughly informed surgeon, well-read, observant, judicious, a lover of simplicity, wisely doubtful. I think, too, he must have been an eminently safe man, who might be relied on for knowledge or doing whatever, in his time, could be known or done for the good of his patients. In this view, I believe he was as good a surgeon as Hunter" (Paget's Hunterian oration, 1877). D'Arcy Power (National Biography) says that while his works contain nothing that can justly be called pathology, or the principles of surgery, nor any sign of a really scientific method of study, yet they are replete with practice and practical procedures. With Cheselden as his master, Warner as his immediate pupil, and Hunter as his "pupil by tradition," Sharp becomes interesting as the connecting link between the old and modern surgery.

Very justly is Sharp thus highly esteemed as a surgeon. But none the less justly may ophthalmologists claim him as one of their most learned and progressive pioneers, and as one of the most brilliant ornaments to ophthalmic surgery. It is fitting, therefore, that his life and work be recalled and a registry made of them in the present-day annals of ophthalmology.

EXTRACTION OF ANTERIOR CAPSULE IN CATARACT OPERATIONS—MORPHIA HYPODERMICALLY IN SIMPLE EXTRACTION.

BY EUGENE SMITH, M.D.

DETROIT, MICH.

PRONE as we mostly are to the easy satisfaction on imperfect evidence and to rest in the *experimentia fallax*, I desire only to lay before you the fruits of my own experience.

Regarding the extraction of the anterior capsule, let me refer to one or two of the anatomical features of the capsule. The anterior capsule is twice as thick as the posterior capsule. Most anatomists consider that the hyaloid membrane blends

completely in front with the posterior capsule of the lens, which, in fact, represents it. There are other anatomists who think differently. If such were the case, i. e., if the hyaloid and posterior membranes were completely blended, would we be apt to extract the lens in its capsule without rupturing the hyaloid and getting an escape of vitreous? I think not.

Another fact: The anterior capsule is twice as thick at the anterior pole as at the equator. This point is evidenced by a bit of experience which has probably occurred to each of you, viz.: When we have wished to divide, with a needle, a secondary cataract that is somewhat thicker than usual, we have observed that the spot directly attacked with the needle did not tear, but a rent occurred in a portion of the capsule toward the periphery, and we failed to get a central opening.

The history of cataract operations and the very great diversity of practice in dealing with the capsule among different operators is abundant proof that the methods in common use are faulty in some respect. I wish to advocate the extraction of the anterior capsule as the best means of dealing with the capsule in any form of cataract extraction. It is not, perhaps, to be wondered at that more operators are not following this method, when we consider the amount of "cold water" thrown upon it by renowned teachers who hold up that "bête noire" dislocation of the lens, by pressure of the forceps in an attempt to seize the capsule. Dislocation is infinitely more apt to occur with the cystitome, and particularly if the capsule is thickened.

Knapp, some years since (1892), said: "There is a dark side to the secondary discission of the capsule—I mean the appearance of glaucoma." Others have noted the same, as well as the various forms of uveitis, etc.

It is a well known fact that seventy-five or more per cent. of the ordinary cystitome operations on the capsule require discissions later. Such is not the case where the capsule has been removed. In my experience less than three per cent. require subsequent discission; hence the fear of glaucoma and the other serious conditions occasionally following discission has been nearly removed from my practice.

I have not found a distinct opacity of the posterior capsule, except in cases where some degree of inflammatory reaction followed incomplete toilet. I have found rather a wrinkling, which I attribute to a lack of elasticity of the vitreous. The discussion of this wrinkling I have ever found simple and seldom followed with inflammatory reaction.

Personal equation cuts but very little figure in the use of the forceps. In 1891 (Sept. 6th number of the *Journal of the American Medical Association*) I published an article on "How to Deal with the Capsule," and gave to the profession a forceps which I had devised some time before, and which I have continued to use in all of my cataract operations since. In less than one per cent. of my cases have I failed to grasp and remove a large segment of the anterior capsule, and never have I dislocated a lens with the forceps. Many times I have removed the lens in its capsule, and never with loss of vitreous.

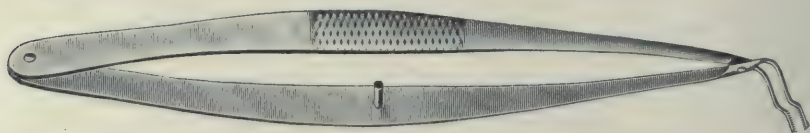
In a classic article by Landolt—"L'Opération de la Cataract de nos jours" (published in the *Archives d'Ophthalmologie* for 1892)—Landolt speaks favorably of my forceps and of having removed a lens in its thickened capsule without loss of vitreous. I have frequently, in cases of this character, gently loosened the lens from the suspensory ligament by a mild circular movement of the entire lens, after having grasped the capsule, before extraction.

I do not wish to convey the idea that I never have loss of vitreous in ordinary cases. I do, but no more so with the use of the forceps than in former years with the use of the cystitome. My particular reason for using the forceps has always been to escape the necessity for and danger of discission, and my experience in several hundreds of cases during the past thirteen or fourteen years has been all that one would wish for.

We have practically all experienced difficulties in the extraction of Morgagnian cataract where we have used the cystitome. A slight tear of the capsule permits the liquid cortex to escape, leaving the nucleus at the bottom of the wrinkled capsule, held as in a grasp; all endeavor to get it out increases the dangers. It has been my fortune to have had considerable experience in this class of cataract, and I had

troubles of my own with the old cystitome and Greafe's knife, used to cut the capsule. Since, however, I have used the capsule forceps, I have never experienced any difficulty, the entire extraction being, usually, simple.

The forceps, as made for me by Luer, of Paris, contain four teeth on one blade and five on the other. The teeth are set on the under side of the drop, or curved portion of the blade, and only the points of the teeth made sharp. The curve is located about 2 mm. from the ends of the blades, and is 1 mm. in extent. The curve is so gentle as not to interfere with the introduction of the forceps into the anterior chamber. The blades open automatically 5 mm. When the teeth are closed the blades are $1\frac{1}{2}$ mm. apart, which prevents catching or bruising the iris. As the teeth drop into the pupillary space when introduced, there is no necessity for tilting the blades and thus pressing the flap.



Morphine hypodermically in simple cataract extraction.—In *Knapp's Archives* for 1894, page 85, is published an article written by myself on this subject. For some reason I feel that it has not met with the frequency of use it merits. As a myotic it is, in length of action, far superior to eserine, and the liability to prolapse of the iris is lessened by its use.

We are all aware of the fact that for hours after a cataract operation patients suffer pain or discomfort, and the tranquility so desirable is many times wanting on this account. Then, too, the discomfort may cause unconscious efforts to keep the eyes still, which may also produce prolapse by contraction of the recti or pressure of the orbicularis muscles. A cough, too, which is generally considered objectionable, is easily kept within bounds by the morphine.

Until a few weeks ago I have never known morphia, hypodermically, to cause vomiting. I think in this case it was due to individual idiosyncrasy. I am pleased to state that

the vomiting did not cause a prolapse, and the patient made a good recovery with a central pupil.

The sedative effect of the morphine and its strong myotic action fulfill very important desiderata in simple cataract extraction. I do not know whether the contraction of the pupil is due to the sedative action of the morphine upon the sympathetic nervous system, in consequence of which the capillary vessels of the iris become somewhat engorged and the pupil contracts strongly, or that a stimulation of the motor oculi centers causes the contraction. Suffice it to say, both a strong miosis and a sedative effect are produced. I give one-eighth of a grain immediately after the operation, and follow it once in three hours until 3 or 4 doses are given. Eserine is used, as usual, although I have, many times, depended entirely upon the morphine, not using the eserine at all.

CONCERNING THE SAFEST OPERATION FOR SENILE CATARACT.

H. GIFFORD, M.D.

OMAHA, NEB.

WHEN the title of this paper was sent to the Secretary, I was experimenting with a form of cataract operation, which I fondly hoped would prove the safest yet. Subsequent experience has blighted this hope, but I have nevertheless thought it worth while to give the Academy the results of my experimentation, together with such conclusions regarding the safest operation for cataract as I have been able to draw from nineteen years of an average practice.

Some twelve years ago DeWecker proposed drawing the loosened conjunctiva over the cornea by a purse-string suture in most cases of large accidental wounds of the cornea, and the method had such obvious advantages in the case of aseptic wounds that after using it for several accidental wounds it occurred to me to try it in cataract extractions, when the danger of secondary infection was unusually great; or where there was almost a certainty of loss of vitreous unless some extraordinary method of closing the wound were adopted. The purse-string suture, however, had the disadvantage of

preventing any inspection of the anterior chamber and iris, beside reducing to a minimum the action of atropine drops; hence when I first put the idea into practice, in 1901, I used what may be called a half purse-string suture; the conjunctiva being dissected back from the upper half or two-thirds of the limbus only; the stitch however, starting below the cornea and passing clear around it. When a stitch of this sort is tightened the conjunctiva is drawn over the upper third or half of the cornea leaving a space below for the inspection of the iris. The first patient on whom this was tried was a man with a luxated traumatic cataract with T + 2. The stitch was put into position, the ordinary incision made, and immediately after the extraction was completed the thread was tightened drawing the conjunctiva down over the upper $\frac{1}{4}$ of the cornea. There was practically no reaction and the final result was excellent. In this case I made the mistake of injecting a cocaine solution under the conjunctiva. This made the flap so stiff that it could be drawn past the edge of the wound only with difficulty. In subsequent operations of the kind I used adrenalin freely and anæsthetized by touching the conjunctiva with swabs moistened with 20% cocaine.

I used the same method on four other cases of dislocated cataract, one case having the additional complication of a purulent dacryocystitis, incurable in the time at the patient's disposal. The results so far as the prevention of loss of vitreous and infection was concerned, were perfect in all these cases, and the question then presenting itself was: If this procedure gives such good results in complicated cases why not be logical, and give all cases the extra protection which it affords? I could see no good argument against the proposition and proceeded to use a slight modification of the method in five ordinary or only slightly dislocated cataracts.*

* The modification consisted in using instead of the half-purse-string suture a single simple suture passed from a point just outside the middle of the loosened conjunctival flap through the conjunctiva at the outer margin of the cornea. This stitch being inserted and drawn to one side before the incision is made, when tightened, draws the conjunctiva over the upper half of the cornea with much greater ease than any other stitch that I have tried. It produces a pucker which can be excised with a snip of the scissors. This gives a result approximately like that obtained by the method of Kuhnt, but is simpler.

I do not, however, give it my unqualified approval, because in one case

By doing so I hoped to accomplish three most important things: 1st, the prevention of secondary infection; 2nd, the prevention of loss of vitreous in case of rupture of the zonular ligament, either before or at the time of the operation; 3rd, a prevention of iris prolapse by the additional support which the tense conjunctival flap gives to the corneal flap, thus allowing one to dispense altogether with an iridectomy, without the anxiety which has hitherto attended the simple operation.

The results in the first three cases were ideal. In spite of the fact that the new technique made the operation longer than usual, there was absolutely no reaction in the shape of pain or congestion of the iris and the visual results were above the average. The stitch caused absolutely no discomfort and came out or was taken out on about the sixth day, and the conjunctival flap gradually retracted to the edge of the cornea. In one of these eyes a preparatory iridectomy had already been performed, but in the other two a round pupil was left. Then followed in swift succession two infections. In the first there was a slight iris prolapse in spite of the tense conjunctival flap. To be sure the prolapse was entirely protected by the flap, and would of itself have caused no inconvenience nor danger, but with it there was a decided infection of the anterior chamber, with much pain, congestion and exudative iritis, subsiding under salicylate of sodium in the course of two weeks, and giving after a discission, vision = $\frac{20}{100}$.

The fifth patient was of an exceedingly tranquil disposition and although on the fourth day there seemed to me to be more congestion and discharge than was right, he complained of no pain, but on the next day it was evident that there was an infection. The stitch was removed, and the edges of the wound and the anterior vitreous were found to

in which I used it the eye was lost from purulent infection of the vitreous, the infection starting as nearly as I could tell at the stitch, and since this method brings the thread hole nearer to the angle of the wound than the purse string or half purse string suture it may be safer to use the former as has been recommended by Ellett, or a partial purse string which would leave only the lower third of the conjunctiva attached, and thus combine the advantage of allowing some view of the anterior chamber with an increased distance between the stitch and the angle of the corneal wound.

be purulent, and the case went on to partial necrosis of the cornea with mild panophthalmitis, and the eye was eviscerated. Thus having proved to my entire satisfaction that the large conjunctival flap is not a sure preventative either of secondary infection nor of iris-prolapse I decided that until some further perfections in the technique should make it safer I should reserve it for cases, in which, on account of a dislocated lens or some incurable infection, the dangers of the ordinary operation for cataract would be extraordinarily great. The fact that all of these large conjunctival flap operations, including those of Kuhnt, C. H. Williams, Ellett and Czermak, involve stitch holes through a membrane which we can never depend upon being aseptic, may always prevent anything on this principle from coming into general use. In the operation of Czermak it is true the stitch is placed at considerable distance from the wound, and might be dispensed with altogether, but it remains to be seen whether the difficulty of cleansing the sub-conjunctival pouch of soft lens matter and of dealing with iris prolapses, if they occur, will not limit the application of this operation also, to a comparatively narrow field. The operation of Czermak is, of course, a direct descendant of the operation of Desmarres as revived by Pansier, in which a large conjunctival flap is made, but not detached; but while this operation involves no stitching, the objections already urged against Czermak's operation may account for the cool reception which it apparently has received in its French home.

Dismissing, now for the present, the use of very large conjunctival flaps with one or more stitches as a routine measure, a brief discussion of the ordinary small conjunctival flap may not be out of place. It generally goes without question that if the operator believes in making his incision far enough out to permit such a flap to be made, it should be made as a safeguard against secondary infection. Personally, I have always had a great deal of faith in the efficacy of these flaps, and at one time, but a few years ago, I made the flap much larger than is commonly done, not only at the summit, but at the angles of the wound. I was enabled to do this by making subconjunctival injections of cocaine, as has also been recommended by Koller, producing a bleb along the whole extent of the proposed wound, but I became convinced

that this was a bad practice, the artificial œdema of the flap apparently interfering with its ready co-aptation at the close of the operation. I have accordingly returned to the use of the small conjunctival flap, but even this has some slight disadvantages, the chief of these being that even when turned forward as far as possible, such a flap makes it less easy to do a clean iridectomy; and where a prolapse of vitreous occurs, it is a distinct hindrance to the closure of the wound. These objections, however, do not seem to me serious enough to warrant giving it up.

As to the iridectomy, we can all agree that if it were not for the danger of iris prolapse, extraction without an iridectomy would be the rule. But while doing the simple operation I averaged about twenty per cent. of prolapses, possibly because, in order to get a conjunctival flap, I made too peripheral an incision. While, therefore, I envy the results of those who get only three to five per cent. of prolapses, I have ceased trying to emulate them, and make an iridectomy in all cases of senile cataract.

With those who take a similar view, the only question then is whether to make the iridectomy at the time of the extraction or as a preliminary operation. This has been threshed over a good many times, but the point is so important that until some consensus is arrived at I believe it should be reviewed occasionally. The chief objections to the preliminary iridectomy are, first, that it involves opening the eye twice; to this it may be said that a simple uncomplicated iridectomy is so nearly entirely safe that the increased risk involved by it is almost negligible. Second, that it involves greater loss of time, and, if the patient lives at a distance, an appreciably greater expense. This cannot be denied, but if on other grounds it is decided that the divided operation is safer, it seems to me that if the physician is in doubt as to whether the increase in safety more than counterbalances the increase in expense, the patient is the one to decide which he prefers. In favor of the preliminary iridectomy is the unquestionable fact that the slighter the traumatism at any given operation, the less the danger of infection. With the iridectomy out of the way, the final extraction can be done, if the capsulotomy is made with the knife, with the intro-

duction of only one instrument into the eye, with a minimum of traumatism, bleeding, pain and loss of time.*

Another point in favor of the preliminary iridectomy, which in my opinion has not received sufficient attention, is the lessened danger of small prolapses. This point has been urged especially by Aubineau, and is a very important one. These slight prolapses are so common, when the iridectomy is done at the time of the extraction, that Hirschberg, in a discussion of the subject, remarked that prolapse was as common with the combined operation as with the simple one. This statement, while it may be literally accurate, is not entirely candid, because most of these prolapses are so well concealed that they cause no disturbance; but it happens every now and then that a small prolapse at one end of the wound is a most troublesome thing and occasionally leads to sympathetic ophthalmia, more often, perhaps, than the larger prolapses, which occur with the simple operation. When the preliminary iridectomy is done, however, the angles of the coloboma become attached at the periphery of the anterior chamber, so that when the extraction is made the iris very seldom prolapses. In fact, I have never seen any difficulty from this cause after the divided operation. In view of these considerations I cannot help feeling that if I had a cataract myself, I should want it operated with a preliminary iridectomy, and doubtless many of you remember the occasion at a meeting of the British Ophthalmological Society, when the question was asked if there was any one present who would not prefer this operation for his own eye, and no one responded.

The custom seems to be with those who believe in the preliminary iridectomy to recommend this to patients who

*One great advantage of the simple operation over the combined extraction as commonly done, is its painlessness. The pain experienced on seizing and cutting the iris, no matter how much cocaine has been dropped into the conjunctival sac, unnerves many patients, and some operators; but if two or three per cent. cocaine be injected under the conjunctiva so as to make a bleb around the lower half of the cornea, the iris can in most cases, after about five minutes, be seized and cut without causing any pain. I formerly made this injection around the upper half of the cornea, thus accomplishing the same purpose even more quickly, but as before mentioned have given this up on account of its tendency to interfere with rapid co-aptation, or adhesion of the conjunctival flap.

have but one eye, but not otherwise. I have never been able to see why we should not give a person with two eyes as good a chance for the first eye as for the second, and I consequently recommend the divided operation to all patients; making it clear, where the patient has two good eyes, and the question of time and expense is of great moment, that while I should prefer the divided operation if it were my own eye, the difference in the risk between the divided and the combined operation is not great, and allowing him to make the choice; but where the patient has only one good eye, I urge the divided operation without qualification.

In doing the divided operation, however, one must avoid the temptation to suit the patient's convenience and purse by making the extraction too soon after the iridectomy. There can be no rule about the length of time which should elapse between the two operations. Occasionally an eye is as ready a week after the iridectomy as it ever will be, but in some cases it is better to wait two months, and it is always imperative, in order to decrease the risk to the minimum, to put off the extraction until every sign of increased discharge and irritability has entirely disappeared.

COMPLICATIONS FOLLOWING CATARACT EXTRACTION IN GLAUCOMA.

By DR. LOUIS J. GOUX,

DETROIT, MICH.

THE object the author has in presenting his experience in one case of cataract extraction in a glaucomatous eye is to not only relate the history of this particular case, which is at least to say unusual and fortunately uncommon, but also to gather an expression from the members of this Society of similar experiences, and to learn as far as possible the best way of handling these cases as regards prophylaxis and after treatment.

Report of case.—Miss W., aged 60 years, inmate Eastern Michigan Asylum, Pontiac, Michigan, first examined October 20th, 1903. Complains of great pain in eyes with nocturnal exacerbation; vision greatly impaired.

Objective symptoms, injected ocular conjunctivæ, steamy

cornea, shallow anterior chambers, oval dilated pupils. Media clear. Tension plus 2 in right and plus 3 in left.

Treatment, dionin and eserine.

February 16th, 1904 —Lenticular opacities in left eye, media clear in right. Tension diminished and eyes less painful.

April 19th, 1904.—Complete cataract in left eye. Tension plus 2, very shallow anterior chamber. Right eye more comfortable, tension plus 1.

The eyes being in a more comfortable condition than they had been for months, on May 10th it was decided to do an iridectomy and cataract extraction in hope of relieving the glaucoma and restoring vision in left eye. Operation performed under cocaine anaesthesia. Interocular pressure was so great that as the primary incision was completed the lens followed knife through the wound and immediately there was a considerable escape of vitreous.

The lens had been delivered by intra-ocular pressure and collapse of eyeball was so complete that after vitreous had been removed from wound dressings were applied, no attempt being made to perform iridectomy.

Patient was placed in bed, morphine used hypodermically and special attendant provided to carry out instructions. About two hours after operation, patient had intra-ocular hæmorrhage, about a drachm of clotted blood being found under dressings. Wound was again wiped dry and no further untoward symptoms were complained of or were noticed objectively until the fourth day, when the dressings were noticed to be wet with a serous exudate. Examination revealed a very small sinus located at the apex of corneal cicatrix.

Dionin and eserine were again ordered, but after about two weeks all medication was discontinued.

At the present time the vicarious channel still exists, vision is nil, and the eye is evidently doomed to phthisis bulbi.

The experience suggests the following query, viz: "Was there any prophylactic or ante-operative measures other than medicative that would possibly have changed the result?" To the writer the most logical prophylactic measure that suggests itself is that of scleral puncture (posterior sclerotomy). By means of this simple operation the tension

of the eyeball can be sufficiently reduced so as to bring about a return of anatomical relations of the parts, making the steps of iridectomy and extraction as easily performed as under normal conditions. For this prophylactic measure it is claimed that in cases of high tension the iridectomy can be much more thoroughly performed when preceded by this precautionary measure.

According to Priestley Smith the results of iridectomy in glaucoma depend largely upon the mode of performing the operation, and he points out the advantage of scleral puncture before the knife enters the anterior chamber.

The development of cataract in this case was clearly dependent upon impaired lenticular nutrition, due apparently to excessive intra-ocular pressure.

The other eye has not developed cataract, at no time has the tension been as high as in operated eye, and at present time is about plus 1 or less.

The chances are that intra-ocular hæmorrhage was unavoidable and that no prophylactic measure would have changed this phase of the situation.

The cicatricial fistula furnished an interesting illustration of nature's attempt to relieve the situation by means of vicarious infiltration.

REMARKS ON THE NEED FOR THOROUGH ASEPTIC AND ANTISEPTIC WORK PRIOR TO, DUR- ING, AND AFTER CUTTING OPER- ATIONS ON THE EYE BALL.*

By DR. B. E. FRYER,

KANSAS CITY, MO.

WHILE the questions of antisepsis and asepsis in general surgical work are problems quite far from a perfect solution, and dwelling, as these questions do, in the mind of every general surgeon more or less continually, with the resultant hope of attaining nearer to a perfection of technique, it must be said that in general surgery there is, as is well known, more or less continual development and improvement in these important adjuncts to surgical success. Moreover,

every careful general surgeon, as a rule, understands the many factors required for asepsis, which I fear is not the case with a large number of ophthalmologists, if the writer can judge by the literature made by oculists on ocular asepsis, or by his experience in medical societies and conferring with ophthalmic surgeons generally.

In this brief paper I propose very concisely to set forth the need for a greater effort to obtain an aseptic condition for eye surgical operations and also to call attention to some of the main factors needed for successful work in this direction, and moreover, to show that those who are inclined to doubt or who do actually doubt the possibility of any eye asepsis being made at all possible, are in error.

It is conceded, of course, that many of the well known bacteria which are found in normal conjunctiva, live there without the production of any palpable pathologic change or lesion so long as no wound or abrasion exists, but that others of these microbes require no epithelial denudation prior to their destructive working. Moreover, very many bacteria succeed in their destructive doings in a direct ratio with diminished systemic resistance of an individual, plus local lessened resistance, caused by traumatism of any or all kinds.

It is not necessary in this paper to mention in detail the various pathogenic bacteria which are found in the conjunctival sac; they are well known, though it is, of course, possible that pathogenic microbes may be hereafter discovered which are at present unknown and which are generally of unsuspected existence. The habitat of all them is not alone in the conjunctiva proper, but in the glandular openings and follicles, of which there are many in the inner lid surface and which our colleague, Alt, has shown in his excellent work very fully, as he has also shown the existence of accessory lachrymal glands in the lids. Of course, too, the puncta are the avenues from the nares for admission of septic germs. Moreover the Meibomian glands and the bulbs of the eye lashes, the edges and free eye lid surfaces are also sites and hiding, and probably breeding places of these pathogenic workers. The sites as above given are, I admit, generally known, but just as to where in them the bacteria lodge, I believe is neither generally known or understood. In other

words, these sepsis producers live and work not only on the external epithelial surfaces, but in and between the epithelial cells, of which latter we have in the conjunctival sac and its appendages and surroundings many differing from each other morphologically, and also as to the amount of cement substance surrounding each cell and attaching it laterally to its neighboring cell and also to those of the layers beneath, where such lower layer or layers exist.

These facts have a very direct and practical bearing on the production of any aseptic conditions for our line of work. For if the microbial life in the conjunctiva and its appendages inhabited only the surfaces of this mucus membrane and was not found also enjoying a flourishing existence between and under the epithelial cells, the question of inhibition, expulsion and death of this microbial activity might be a much easier and simpler matter.

In order to fully appreciate the need for antiseptic work prior to eye operations, it is well to state that the whole subject of inflammations should be restudied, late pathological experimental work, showing that inflammation processes in their completeness mean that sepsis has preceded them, that either a local septic or a general toxic cause has produced the condition, and that a local trauma or irritant will not, cannot alone produce the full conditions now understood as inflammation. For the eye we may instance as a local septic cause the various pathogenic bacteria as productive of iridocyclitis with the aid of trauma, or of syphilitic or rheumatic iritis from a general and systemic toxin, as the etiologic factors without trauma. It will not do then, if this is true, to assign as a cause of an unsuccessful eye operation the trauma alone, as is generally done by oculists who do not precede their operations with antiseptic precautions and efforts.

It is conceded that many operations on the eye are done and have been done successfully when no attempt has been made toward asepsis, and from this it is argued by some that none is necessary. And while it is true as following eye surgery as it is also true of general surgery, that success has occasionally resulted where no antiseptic attempts were made, still no general surgeon now will believe that any antiseptic efforts should be relaxed, but that operative successes without anti-

septic precautions are simply due to the fact that a certain but limited amount of septic material may be met, destroyed and provided for by systemic antitoxins. But this auto-antitoxic neutralization of septic matter is probably less likely to be available for work in the eye from the different anatomical conditions, and at the same time there is apt to be more destructive effect to the usefulness of the visual organ than occurs from sepsis of a less important function or viscus elsewhere.

It is of interest to the operator to consider that sepsis may gain admittance from local sources: First, from ante-operating factors, such as corneal ulcerations or wounds giving sepsis admittance; second, from septic material introduced at the time of an operation; or, third, as a post operative result from meddling of patient with dressings, or by operator if the latter does not follow antiseptic rules in the after-treatment. It is our duty to try and shut off the septic approach through any of the before-mentioned avenues or modes by every safe method we possess.

Now a few words as to what I consider the best method of safely rendering the field of operation in eye surgery free from septic material. Having tried several germicides in preparing eyes for operation, I have come to the conclusion that at present no known drug or preparation equals argyrol for the purpose. It is most efficient as a destructive of microbic life, without in the least injuring the eye ball or its appendages. This is the first requirement for eye antisepsis, but in addition its permeability and penetration are most remarkable, thus not only destroying microbes which may be on the conjunctival surface, but also going between epithelial cells and even below the first layer of these cells. Argyrol also passes readily through the puncta lachrymalia and into the glandular crypts and follicles, and into the nasal ducts. I use argyrol in thirty per cent solution.

I will give an outline of the method I pursue in the antiseptic preparation of an eye for operation. The face, brow, temple and eyelids are carefully washed with soap and water; after this the same regions are cleansed with a two per cent. solution of carbolic acid. This is thoroughly done, and especial care is had in rendering the lids and their free edges

absolutely clean. Then a few drops of a thirty per cent. solution of argyrol is instilled into the conjunctival sac, the eye closed and a sterile gauze dressing of several layers dipped into the carbolic acid solution is applied to the eye, which dressing is large enough to cover the eyebrow, temple edge and the upper part of the nose of the same side, and also cover the upper cheek surface, and this dressing is retained in position with ising glass plaster; no bandage is applied. This dressing is changed each day, and each day the argyrol solution is instilled, the patient being watched to see that the dressing is not disturbed or the eye rubbed. The number of days required for the complete antiseptic preparation varies, of course; it may take a week or even three. Should there be any nasal disease the nares are sprayed with a solution of iodine in liquid vasaline daily.

If this method is followed carefully and kept up long enough it will result in the production of an antiseptic interval of the conjunctival sac—an interval sufficiently long enough for the closing of any wound or incision, and that without any disturbance of nutrition. After an operation the dressing is generally not changed for forty-eight hours, and when changed the work is done under antiseptic precautions, and before applying a new dressing argyrol is instilled if necessary. No bandage or shield is applied mainly for the reason that with a bandage any change of position of the patient's head upon the pillow will displace the dressing.

I insist in my capital operations that a careful nurse shall be in attendance and watch the patient day and night to prevent any interference with the dressing on the eye. This last precaution should in no case be omitted.

It cannot be necessary to say that the most scrupulous care is necessary to render all the instruments used absolutely sterile, and also that the hands of the operator and assistants are so. Moreover, before the operator's and assistants' mouth a gauze cover is applied.

In every case of a capital nature, too, the general health and condition are seen to and the urine carefully examined.

DISCUSSION OF THE PAPERS BY DRS. SMITH, GIFFORD, GOUX
AND FRYER, CATARACT EXTRACTION, ETC.

J. M. RAY (Louisville, Ky.): The papers we have just listened to have presented such a quantity of material for discussion, it seems difficult to know exactly where to begin a consideration of the questions. The paper by Dr. Smith, in which I was very much interested, brings up the question we are all much interested in of how to deal with the capsule in cataract operations.

There is no question but what the best method of dealing with it has not yet been settled, and a great many of the most serious complications met with in cataract have been those resulting from secondary operation, so I look on it with much trepidation and concern. Twenty years ago I saw DeWecker doing the operation of removal of the capsule by a pair of forceps similar to those of Dr. Smith. In my experience it does not bring away the capsule in every instance. A great many cases fail to make more than simply a number of rents in the capsule.

In a certain number of cases I believe it can be removed, and when this is done there is no question but what the formation of a secondary membrane is materially lessened but not done away with entirely.

The great trouble in using morphia as suggested by the essayist, is the danger from nausea. Heroin, however, is one of the morphine series which can be used with less danger of nausea. I do not think it would, however, have the same effect as a myotic.

In regard to the cataract incision, I am a believer in the small conjunctival flap. The ideal incision is in the sclero-corneal margin and with a small conjunctival flap. The trouble with the operation of Dr. Gifford, is that on drawing his suture, the pressure is near the center of the cornea, and thus causes the wound to gap, and therefore you will have as many, or more, prolapses, as when done with the small flap without sutures.

I believe when we have large wounds of the cornea, the purse string suture is ideal, it lessens infection, and we can save a great many more eyes with extensive wounds than by any other method.

The question of what is the best operation for cataract I presume will never be settled to the satisfaction of every one. If it were not for the prolapse, the simple extraction would undoubtedly be the operation. I have never been able to get results I hear of others getting. Frequently I have a prolapse and trouble with it. I always sleep sounder the first night after I do a cataract operation if I do an iridectomy.

DUDLEY S. REYNOLDS, Louisville, Ky.: The difficulty in dealing with the capsule has been constantly before my mind, as it has that of others. In 1876 I reported some extractions done by peripheral incision of the capsule, which Dr. Knapp, who was present at the time, kindly appropriated without reference to me. He is welcome, however, as I abandoned it long ago. I have acquired the habit of using almost exclusively the Beers knife. I make the corneo-scleral puncture, pass the knife into the center of the pupillary area and pass down as low as possible in contact with the anterior capsul, and with a slight motion of the hand cause the point of the knife to go through the capsule. Sometimes it goes through making a little flap, and then I make the counter puncture of the corneo-scleral junction so as to have a small conjunctival flap. I believe this, as a general proposition, in uncomplicated cases, the best procedure. I never use fixation forceps. I always rely upon cocaine anaesthesia. The stitch in the flap was first used by Henry W. Williams, father of our colleague Chas. H. W. He first used a single stitch, which he put in the center of the flap and which he used more than forty years ago, and he continued to use this up to the time of his death. That was a comparatively simple stitch, and I employed it a number of times myself and it caused such irritation in the eye that I abandoned it. The question of the danger from prolapsus has, it seems to me, been clearly stated by Dr. Ray. I should fear to use the dressing he mentions because of the gapping in the wound. As to prolapse of the iris after extraction, I am entirely convinced it is due to faulty dressing. A dressing which causes the least possible pressure, or no pressure at all, is the ideal one. As to the bandage, I think I am on record more than twenty-five years ago against it. I do not use the isinglass dressing. I use gauze, a single thickness,

smeared with petroleum and laid over the lash. I spread a little cotton wool so as to fill up some of the inequalities, and then lay a series of narrow strips of plaster to completely cover the eye and at the same time so loose as to make it impossible to have pressure. In the case of a prominent eye and low brow and cheek where I find it difficult to cover the eye without making pressure, I lay the strips along the nose and temporal side without crossing the center except with the gauze. I do not always do the simple operation, but I do so if I can. Iridectomy is a wound sometimes fraught with grave consequences, and I think it is not a desirable complication to add to cataract extraction.

H. V. WÜRDEMAN, Milwaukee: I take issue with my esteemed friend on the subject of the simple operation. I have made a great many such experiments; all my simple operations have been experiments, and it has taken me several hundred to learn not to do such in the future. My successes in simple extraction in securing perfectly round pupils are perhaps ten per cent. I am ambidextrous and my nerves are fairly good. As regards these flap operations, to those of you who make the Snellen flap—perhaps, too, those who do the other forms of operation these will not appeal, except where we have wounds of the cornea, or where we have inflammation, as I have made it following Dr. Ellet's suggestion and Dr. Gifford's work, of which I heard a year ago. The Snellen flap made in cataract extraction is the small conjunctival flap; the healing begins immediately, and on the next day the flap is fully adherent. We have no trouble from bleeding since the advent of adrenalin. I always have a stitch ready, using the Williams method, but do not put it in always. In vitreous prolapse I always put in the stitch, not necessarily through the corneal edge of the wound, because I, as a rule, have a sufficiently large coadjunctive flap in which to insert the stitch, and have never after the operation found any vitreous prolapse in almost one thousand extractions. They occur during the operation, and are due either to the maneuvers of the operator or to the movements of the patient. I am much pleased to advocate Dr. Fryer's method in the preliminary preparation of the patient. I insist, even in public practice, that there should

be at least twenty-four hours preparation. I have pinned my faith to argyrol and have not been disappointed.

J. J. KYLE, Indianapolis, Ind.: It is a fact that the greater the trauma the greater the liability to infection. I believe with Dr. Reynolds, we can do away with the fixation forceps and thus lessen trauma and therefore danger of infection. I believe that the best results I have had were with the small conjunctival flap. As Dr. Wurdemann says, the adherence takes place within twenty-four hours, and you thus lessen the danger of infection getting into the anterior chamber. I take issue with Dr. Wurdemann in regard to using adrenalin preliminary to making the cataract extraction. Some of the gravest hæmorrhages have followed its use, and I do not believe we can depend upon it as a hemostat. In regard to the preliminary preparation of the eye, I think Dr. Fryer has established a very good precedent. The past year or so I have depended on irrigations of hot boracic acid solutions rather than bicloride solutions. It is impossible to get the conjunctiva free from organisms, but if we can lessen our traumatism, nature will take care of the organism already in the conjunctiva.

J. A. L. BRADFIELD, La Crosse, Wis.: I am heartily in sympathy with the last paper on preparation for extraction. The first thing to be considered is the least possible injury to the eye. Whether we make an iridectomy or a simple extraction, the question is which causes the most injury. When there is a large lens, I believe the iris is more injured by the lens passing through the pupil than it is produced by a simple iridectomy. If Dr. Gifford uses cocaine as he reports, I do not wonder that he has prolapsus, and I should not wonder if he has wounds which do not close. Used as he says I believe it is detrimental to the nutrition of the cornea. The adrenalin is valuable in the ordinary case, and it makes the field much clearer, so I much prefer it. Iridectomy should be made in all cases of those poor patients who cannot let us watch them afterwards, or those coming a great distance; in these cases the anterior capsule should be removed. For simple extraction I suggest the corneal incision with the use of atropia. Use it before the operation and there will be a full, large pupil which will not be injured and iris not

dragged into wound when wound opens. Real iridectomies should be made in all cases where there is a heightened tension.

DR. D. T. VAIL (Cincinnati): To discuss these papers anyone could consume an hour instead of five minutes. I wish to mention one or two things not touched upon in these papers. Nothing has been said in reference to holocaine as an anæsthetic remedy. It is more penetrating than cocaine and anæsthetizes the iris much better. I have never found it necessary to inject cocaine subconjunctivally since I began using holocaine. Before its use I had the same experience all have had. If a sensitive iris is grasped the patient cannot refrain from making a squeezing effort, and the usual result is the escape of some vitreous and premature discharge of the lens.

Since I saw some eminent oculists in New York use 1 per cent. holocaine four minutes before the operation and then for two minutes using cocaine, then performing the iridectomy without the slightest movement of the patient, I have resorted to its use in every case.

Occasionally I go back to the old method of making the corneal incision. If I have a case particularly important, where I want absolutely to get the best results, and fee also, I make the incision corneal and do away with the conjunctival flap. I would advise young operators to avoid conjunctival flaps. I would make the incision in the cornea in my first cases and later on I would adopt this "flap" operation.

In regard to Dr. Goux's case of glaucoma and cataract, I think he attempted too much in extracting in glaucoma where the tension was plus 3. One could not expect anything but the result he had—forcible delivery of the lens, hæmorrhages, etc. I would do a preliminary iridectomy with a small keratome, making the incision well back, and by the *vis a tergo* the iris will spring up into the wound, and it is only necessary to pick up the prolapsed iris and do the iridectomy with the slightest amount of traumatism. This restores the tension of the eye to the normal; later on I would effect delivery of the lens in the usual way. I have followed this method and have succeeded without rupturing the hyaloid membrane.

J. W. BULLARD (Pawnee City, Neb.): I wonder if any

of the members present have had the experience with argyrol that I have. I have been using it as a bactericidal agent, and have learned to expect nothing from its use. In purulent conditions of the conjunctiva I have used it day after day without results, the patients returning with the purulent condition, and have gone back to the old nitrate of silver and have stopped the pus. I have not used it in the same way and for the same purpose as has Dr. Fryer, as set forth in his paper. I am wondering if any other member of the Academy has had the same experience I have had. (In answer to the question, I will say that I use it in the strength of 30 per cent.) If he has had the same experience I hope he will be bold enough to state it to this Academy.

ALBERT E. BULSON, Jr., (Fort Wayne, Indiana): The last word on this question of cataract extraction has not yet been said for the reason that we will probably never uniformly agree upon the exact methods of preparing the patient and the kind of an operation to be performed. As a direct result of the better care which the people are giving the eyes by way of proper correction of errors of refraction and attention to other abnormalities, cataracts are becoming less common from year to year. Notwithstanding the fact that some operators glibly talk of performing from one to two hundred cataract extractions each year, I venture to assert that not one operator in five hundred exceeds twenty to twenty-five cataract operations per year, and the number of reputable and experienced operators who do less will constitute the majority.

Considering that every unfavorable result will have its influence in detracting from the reputation of the operator, it becomes necessary to select that method of operation which gives promise of affording the most satisfactory results for the patient as well as the operator. Very few patients care about the cosmetic difference between a round pupil and one irregular in shape, as produced by an iridectomy, but they do care about the quantity and quality of vision. It seems to be a recognized fact that the combined operation in the average operator's hands is the easiest and safest to perform, and the one less likely to be followed by complications. If this be true we are not giving our patients the best chance of recovering the most useful vision if we adopt an operative proce-

dures generally attended with more risk, and having as its questionable advantage a round pupil. I pride myself upon having secured practically $20/20$ vision in quite a number of cataract cases in which the combined operation was performed. In a few instances equally good visual results have been secured by simple extraction, but I have had one or two deplorable results in cases in which I performed a simple extraction, and which I am quite satisfied would not have occurred had the combined operation been performed. I therefore think the combined operation is the safest and best for the average operator, and particularly for the large class of ophthalmologists who see but few cataracts each year.

I am not in favor of a preliminary iridectomy several weeks or months before the extraction is performed, as I think with such method the eye is subjected to the influence of infection and other untoward incidents to operative procedures once more than is necessary.

I cannot agree with Dr. Kyle that extended flushing of the eye prior to cataract extraction is essential. In fact, I think that much of the flushing ordinarily done before cataract extraction is detrimental. As Dr. Fryer has pointed out, many pathogenic organisms are beneath the epithelial layer and cannot be reached by any amount of flushing. Too much flushing only tends to abrad the surface, add congestion and increase the tendency to infection. Our attention might better be directed toward thorough sterilization of the parts around the eye, the instruments and the dressings.

Argyrol is one of our valuable astringents and antiseptics, but I feel sure that the weak solutions ordinarily recommended are of but little use in destroying pathogenic organisms. I have not been able to secure beneficial effects in the eye with the use of solutions of less than 30 per cent, and the solution which I most employ is one of 50 per cent.

For intensifying the anæsthesia and lessening the quantity of cocaine to be employed, I have found it advantageous in the few cases in which I have tried it, to follow Darier's method of injecting cocaine under the conjunctiva following the anæsthesia produced by the first instillation of cocaine. The principal objection to it, so far as I see, is the dull pain following the injection and lasting for some minutes.

MELVILLE BLACK, Denver: I do not believe we will ever convert anybody by these discussions. In looking at the statistics of the subject, they do not vary materially in successful results. I suppose the man who operates along certain lines will continue to do so regardless of what he hears to the contrary. Some months ago I thought I had discovered something, but I found our old friend McKenzie had discovered it fifty years ago. It is hard to discover anything now-a-days. When we read these old fellows we find they did everything we are doing to-day. I refer to a blunt pointed secondary knife I published a little account of in the *Ophthalmic Record*. I do not now claim any priority on the knife, but would suggest that if you provide yourselves with it you will find it convenient in the event of the iris falling in front of the knife during the section. If you do not wish to cut the iris, by withdrawing the linear knife as soon as the iris has fallen in front of it, and replacing it by the blunt-pointed knife, you will find it easy to avoid the iris. My experience is that the iris falls in front of the knife after the counter puncture has been made. A full description of the technic can be found in the February, 1904, *Ophthalmic Record*.

T. C. HOOD, Indianapolis, Ind.: Here we have Dr. Gifford repeating the well-known recommendation that when we have one eye only we should do the iridectomy, and Dr. Vail saying that when he has a case in which he is particularly interested in getting a good result, he makes the corneal incision. The argument is good in both instances. I do a corneal incision in most of my cases. Like my Ft. Wayne friend, I do not do a great many in a year, but I do a corneal incision in most cases, and I do a simple operation when I can. I avoid iridectomy if possible. If there is a pupil which is sluggish and refuses to dilate thoroughly under cocaine and atropin, I suspect sclerosis of the sphincter pupillæ and that I will have to do an iridectomy; but if it dilates easily, I try to get it out without cutting the iris. If I can, I get it out without much pressure and manipulation.

W. B. BRIGGS, Sacramento, Cal.: In speaking of the ideal operation for cataract, I think there is none that is ideal for all operations and all cases. The personal equation is a

large element in deciding on any operation. The operation the man is most familiar with is for him the best. The man who is in the habit of operating successfully by a certain operation should continue to use the same operation. The simplest operation is not, in reality, the so-called "simple operation," which is in many respects more complicated than the combined operation. It took me many years to decide to try the simple operation, and gradually as I have used it more I have been more pleased with the results, and in suitable cases I believe it as near the ideal operation as it is possible to get. But on the other hand, there are a great many cases not suitable for it, and a great many complications that take place at the time of the operation that will make desirable to do an iridectomy. I do not think anybody ought to be too dogmatic in regard to what operation we should advise. We have to vary our procedure as the condition develops during the time of the operation. In regard to Dr. Smith's forceps, I think favorably of them on theoretical grounds. I saw an eminent Vienna oculist using them some years ago, and I thought he was having more cases of prolapse of the vitreous than reasonably accountable for an operator of his skill, and I have never used them myself. Under the doctor's advice that they are not inclined to increase the number of cases of prolapse of vitreous, I shall be encouraged to try them some time. Dr. Gifford's flap operation I should favor on theoretical grounds, but I shall wait for Dr. Gifford to develop it further before I attempt to employ it.

GEO. F. SUKER, Akron, O.: Theoretically I agree with Dr. Fryer's paper, but practically I do not. In regard to sepsis as a matter of general surgery; firstly, because the eye is an immobile organ, therefore germs will not thrive as well—motion is a contrary factor for the rapidity of bacterial growth. The bacteriological principles employed are not the same as in general surgery. The flow of tears from the lacrimal gland serves as a constant irrigator. If the patient is sleeping and on waking up in the morning you do not find upon microscopic examination in the dry tears in the canthi, a pneumococcus or a diplococcus, but only innocent aerial bacteria, you can make an operation without first excessively flushing.

On the contrary, should you have a pneumococcus or a diplococcus, then appropriate treatment should first be given to get rid of them. The quantity of germs has a great deal to do with the rapidity of infection. A certain amount is necessary to produce any inflammatory action or infection. Therefore gentle squeezing of the lids will expose many from the stomata of the border glands. If you find the germs, flush out with a normal saline or boric solution. If you have any lacrimal sac complication, ligate the canaliculus provided the affection is not an acute one. The reason that some fail with argyrol is that they have too strong a solution and they get a precipitation. You must shake your solution and then it will give you a disinfection of the field to which it is applied. The percentage of silver in all of these preparations is apt to be a varying one. The effect of a 2 per cent. carbolic acid solution is practically nil. I would not use it around the face because it is of no value. You can grow germs in a 2 to 10 per cent. carbolic solution and, by serial culture, in a 1-500 bichloride of mercury solution, if you please. (I have proven this and have published a paper on that score). The eye is the only organ to which the general principles of asepsis do not apply as they do in general surgery. You have to modify them. Any wound upon the eye is not on muscular tissue which contracts and dilates. In most instances the eye takes care of the infection, when ordinary previous care has been exercised in preparing the field of operation.

J. M. FOSTER, Denver: In regard to the simple operation and iridectomy, it has been well said that it is a matter for individual selection. My experience in both has been favorable. We all get good results with one or the other. There is no one special way to operate an eye for cataract. The point I wish to make has been well brought up by Dr. Smith in regard to the use of his forceps. I have been much pleased in using them the last few years, getting excellent results. I do not get more prolapses than before, the forceps do not lacerate the eye, and you do not have to use atropin to get a large amount of the anterior capsule removed. I recommend it to any who have not tried it. Your results will be excellent.

JOS. BECK, Chicago: I do not rise to discuss the eye papers, but to say a word in regard to what was brought up by Dr. Bullard in regard to the irrigation of the eye. I believe the men who do not disinfect the eye and have good results are the same as the men who do not disinfect the mouth, throat and ear. Disinfection does not take place as rapidly as in other parts of the body. As far as my experience with argyrol is concerned, I have used the stuff strong enough in the nose and throat and yet I know it is not the bactericide it is claimed. In the nose and throat it does little good. Finger, of Vienna, has carried on many experiments and finds that argyrol is not of as much value as our old nitrate of silver, and so far as any good action of argyrol is concerned, the 5 per cent. is as good as 50 per cent., and the rest remains as an inactive substance or is wasted. If it is good in 5 per cent as in 50 per cent. it does not appeal to our reason to use stronger solution. It must be a pretty big and strong bug that can live in the 1-500 bichloride as Dr. Suker stated. My experience in surgery is that a 5 per cent. solution is a good disinfectant. I believe alcohol is better for a disinfectant about the face than a 2 per cent. carbolic solution.

W. L. DAYTON, Lincoln, Neb.: Personally, I believe the ideal operation is the combined operation. I must admit that I have made in twenty-three years but three simple operations. Of course I am prejudiced. I think the operation of greatest safety is the preliminary iridectomy, particularly in cases of immature cataracts. It is true to extract the lens too soon after the iridectomy is dangerous, but I will venture to say that of all the fellows of this Academy not one who has made proper iridectomies has had suppuration to follow. I mean a preliminary iridectomy for the extraction of cataract. In reference to the purse string stitch, I have not used it in the cornea, but I have used a certain stitch in the cornea that brought the parts in closer apposition, and found the result was better in spite of the intense puckering I got with it. With reference to Dr. Smith's capsular forceps, I think it much superior to that of Fuchs, and I imagine there will be less danger of laceration of the anterior capsule.

T. W. MOORE, Huntington, W. Va.: In reference to Dr.

Fryer's paper, I wish to call attention to the fact that White, before the American Medical Association, claimed that you could sterilize the conjunctival sac by introducing bichlorid of mercury 1-500 in sterilized vaseline.

DR. EUGENE SMITH, Detroit (closing): I want to make one general statement with regard to the simple extraction: I maintain that a man who has only made three or four in his life is not competent to discuss the subject. I use argyrol two or three days previous to the operation if I find hyperaemia, as we do so frequently in old people, and a few minutes before the operation I drop in a 25 per cent. solution of argyrol. I have seen but one suppuration in five years. I will say with regard to Dr. Goux's paper, that when the anterior chamber is too shallow for preliminary iridectomy, make a posterior sclerotomy, and follow with an iridectomy, as suggested by Dr. Vail. With reference to pain, alluded to by many, I have been in the habit of dropping a solution of cocaine on the prolapsed iris. If not prolapsed, I lift the anterior lip of the wound, drop cocaine on the iris and make the iridectomy absolutely without pain. With regard to the simple or combined operation, both are good. I think the simple is the ideal. I prefer cocaine because it dilates the pupil. It assists me in judging whether or not I can make a simple extraction. Making an extraction through a rigid pupil will be frequently followed by prolapse. The forcible stretching caused by the escape of the lens through the pupil is apt to be followed by relaxation of the circular fibres, which will favor prolapse. I never have used atropine. I find that prolapse after the simple operation is most frequently due to injury on the part of the patient. I think the minimum of injury is always in the simple extraction. It is one operation instead of two, hence it is the *simpler* operation.

DR. GIFFORD (closing): With regard to the tension of the flap causing the wound to gap, the line of tension is mainly from above downward and tends to hold the flap applied instead of making the wound gap. With regard to conjunctival asepsis, we cannot get these germs out of the sac. When Dr. Fryer thinks he has done so I believe he is much mistaken. I know you cannot do it, and have experimented on this so much that unless the doctor has some contrary experi-

ence to show by his own work, I cannot accept the statement that argyrol or anything else will render the sac a septic.

In regard to the dressing, Dr. Reynolds, did you ever get prolapse?

Dr. Reynolds: Rarely.

Dr. Gifford: Then you say it is due to the imperfect dressing?

Dr. Reynolds: To meddlesome interference of the patient.

Dr. Gifford: Then why do you not do something to prevent this? Unless you put on a dressing that will prevent interference of the patient, you have not done all you can do. The nurse may look away, or go to get a drink, and the patient may stick his thumb into the eye or roll over upon it. It is a good thing to have him watched every moment, if the patient can afford it, but you should always put on a dressing that will withstand a considerable blow without transmitting it to the eye, and that does not shift, and that will prevent the patient from sticking his thumb into the eye unless he takes special pains to do so. Some sort of shield fastened with collodium is the only ideal dressing in cataract operation. I was glad to hear Dr. Reynolds advocate opening the capsule with a knife. It avoids introducing an extra instrument into the eye. I use a knife sharpened a half inch on the back as well as the front. I have never had the trouble of escaping aqueous before making the counter puncture. That was the main objection to it. With this knife you can go down to the lower edge of your pupil and then make your counter puncture, and you get a clean rent and seldom have to do a discission after the extraction of the cataract, although if a discission is done with a sharp knife and subconjunctivally, I consider the danger absolutely nil.

DR. L. J. GOUX, Detroit (closing): Regarding argyrol, I have used both 25 and 50 per cent., but feel convinced that I get as good results with 25 as with 50 per cent. In the throat I have given it up, as I know I get better results with nitrate of silver. It has been a disappointment to me in nasal work. In doing a capsulotomy I use the "Fuchs" forceps, which have a shorter shank than Dr. Smith's, and permit the operator to work in closer proximity.

DR. FRYER (closing): In the opening remarks in my paper I said I was convinced that oculists were not on a par with general surgeons in their antiseptic efforts. I am positive in my opinion since this discussion. The conditions and locations of the bacteria that inhabit the conjunctival sac are misunderstood. Kelly, of Johns Hopkins University, I think it was, took epithelial cells from a surface that had been made absolutely aseptic by bichloride and put these in two different tubes. In one he precipitated the bichloride first and then put the cells in a culture tube. In the other there was a very active growth and in the other none, where the bichloride was in force, simply showing that bichloride had rendered the bacteria in these cells inactive but not dead. You cannot produce their death with the ordinary use of bichloride in the eye for obvious reasons, but you can with the argyrol. One thing with regard to the preparation of all our solutions: You go to the ordinary druggist for distilled water and you get it loaded with microbes. These gentlemen who do not get a positive result from the argyrol and an aseptic condition, do not get pure argyrol to begin with. In other words, it contains many microbes. It will kill them, but you have reduced the strength in this way. I have studied this subject very carefully. Dr. Suker's statement that the motility of the eye will not allow the activity of these microbes is an error, or why should we have the gonococci, etc., so active and destructive? You can render these microbes inert better with argyrol than with bichloride, because the argyrol even in 50 per cent. strength, is harmless to the eye but death to the microbes. I will not take the time to discuss the other papers to any extent, but Koller, with whom I have talked in regard to the use of cocaine, says that if it is used long enough in weak solution, it will render the iris absolutely free from sensation. It is better than holocain, which, while it anaesthetizes very well, will not do the work cocaine does.

CENTRAL SUPERFICIAL CHOROIDITIS, REPORT OF A CASE.*

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DISEASES of the fundus oculi presenting lesions recognizable with the ophthalmoscope possess as a rule, principally a diagnostic and pathologic interest. Unless the underlying causative condition be specific disease, the outlook for a cure in alterations of the deeper structures of the eye under every known method of treatment, observes the French therapist, Darier, has been so slight that many practitioners have come to abstain from all serious attempts at any treatment. The case here reported is a fortunate exception, and this may serve as my apology for placing it on record.

One cause of insuccess in the treatment of the affections of the choroid and retina is due to the fact that these delicate structures so rapidly suffer irreparable damage before even the patient is aware of the gravity of his disease; destruction of anatomical elements and an indelible cicatrix are the consequences.

It is quite intelligible, when the anatomical, especially the vascular and consequent nutritive relations which subsist between the inner layer of the choroid (chorio-capillaris) and the outer layer of the retina (the percipient elements, the rods and cones) are considered, that the retina is so generally involved when the choroid is affected, so that in many cases it is necessary to denominate the disease by a term which includes both membranes.

X. Y., a lady aged 30, began to notice that the sight of the right eye was blurred about February 20, 1903, attention being prominently drawn to the defect by the patient's occupation, that of an oculist using the ophthalmoscope and retinoscope daily. Nevertheless at that time the vision was found to be full in amount. The defect was described as a blur of the object fixed with that eye, the surroundings being clear as usual.

Examination with the hand ophthalmoscope at this time failed to show any lesion, the symptom being regarded

as of nervous origin. Two weeks later the vision had fallen to $\frac{5}{8}$. At times the pupil of the right eye was twice as large as the left.

The ophthalmoscope now showed some increased depth of color in the macular region. The symptoms persisted and the vision continued to grow worse, falling to $\frac{5}{15}$. About this time the patient was seen by Dr. H. F. Hansell. Thorner's ophthalmoscope showed slight swelling and deeper color of the macula. Examination by Dr. M. F. Butler revealed the presence of some purulent discharge from the sphenoidal sinus on both sides. The affection of the sinus was regarded as in some way connected with the macular lesion. The blurred vision continued for several weeks. At the end of this period, the vision began to improve quite rapidly. The ophthalmoscopic appearance became more pronounced, consisting of a number of yellowish white plaques—half a dozen—in the macular region. At this time the patient was seen by Dr. Edward Jackson, who was inclined to regard the plaques as situated in the choroid, as they undoubtedly were. The vision continued to improve up to final complete recovery. The ophthalmoscopic findings now consisted of faint yellowish markings in the macular region.

January 19, 1904, eleven months after the onset of the trouble, the patient says that she feels as if there was still "something wrong," although when trial is made of the eye, the object fixed comes out clearly. Vision is $\frac{5}{5}$ mostly.

The macular region O. D. is occupied by half a dozen yellowish plaques looking as if the full red of the fundus reflex had been bleached out.

June 16, 1904, the yellowish white plaques are still visible but much fainter. The patient says she "feels as if the right eye had to make a greater effort to see than the left." She involuntarily closes the right to rest it, but continues the work without special trouble.

The fields are normal for form and color.

The treatment consisted in abstention from use of the eyes for a few weeks and atropine; profuse general sweating was excited by daily hot baths.

There are two points of special interest in this case of fundus lesion. The first relates to the tissue affected. We

were at first inclined to consider it a lesion of the retina, standing in some, but not obvious, relation with the purulent affection of the sphenoidal sinus; but the subsequent development of the yellowish plaques in the macular region makes it about certain that the lesion was in the choroid. It seems undoubtedly to belong to the class of obscure choroidal conditions not yet perfectly classified. Of these, Juler, for example, observes that there are many rare ophthalmoscopic appearances of the choroid which are extremely difficult to classify, as they overlap each other to a considerable extent, and as their pathology is still very obscure. The case here reported is of the variety known as central guttate choroiditis. This form appears to have been first described in England by Mr. Hutchison; it is generally known as Tay's choroiditis. Some of these cases show other changes of the fundus. In most of them, as also in the one here reported, the fovea is less affected than the surrounding region. In many, too, the visual acuity is scarcely at all affected. In connection with these types of choroidal disease affecting the macular region, the so-called retinitis circinata of Fuchs is to be mentioned. While ophthalmoscopically an affection of the retinal structures, microscopical sections have shown marked disease of adjacent choroidal vessels. The subjects of these types of central disease are usually advanced in years. Nettleship, in a paper calling attention to the relation of the choroidal arteries and some forms of localized choroiditis and retinitis asks the question, "Has any one watched the onset of Tay's guttate central choroiditis and seen it either increase or diminish?" He rather suggests a negative answer, though he seems to believe that in one case he was able to determine that the disease had spread over a wider area and that the individual spots had become decidedly larger. In my case we could clearly follow the evolution of the affection from the period when the only visible change consisted of a certain œdema of the macular region to the development of the plaques with the subsequent fading of the same, until their almost complete disappearance. So that at present, it would probably be difficult for an observer who had not seen them when they were well marked to discover them.

In the absence of any constitutional taint, to what cause

are these forms of disease of the macular region to be referred?

Nettleship believes that disease of the posterior ciliary arteries is responsible for these macular affections. Both the choroidal and retinal capillary network of the macula is extremely close, much closer than in any other part of those structures, so that the rapidity of the blood stream is influenced in a greater degree by the condition of the larger arteries which supply it, than where the meshes are coarser. Thus we can understand why, in consequence of endarteriitis or other change of the arterial wall narrowing the lumen of the vessel should affect the macular region especially rather than the more peripheral portions.

In the case reported, the patient was firmly convinced that prolonged, perhaps excessive, use of the eye with the ophthalmoscope and the plane mirror had something to do with her complaint.

Lesions of the fundus from direct exposure to the sunlight as during an eclipse, are well known. The usual results of over-use of the eyes show themselves in asthenopias and hyperæmias that we are all so familiar with in daily practice. Nature usually gives strong hints in this way before the danger line is reached. But cases have been reported from time to time of serious organic lesion directly traceable to over-use.

Upon the discovery of the sinusitis we were at first inclined to ascribe to it the cause of the macular affection; but we have since thought that this was an accidental complication, especially as the ocular disease subsided while the affection of the sinus continues.

DISCUSSION.

EDWARD JACKSON (Denver): I saw this case about the time vision was beginning to improve, and the macular changes were becoming positive. At that time any one would think he had to deal with patches of choroidal exudate. The appearance was that seen in the early stage, and comparatively slight, but still unmistakable. It is an interesting case, and of great value from the fact that it has been followed through its whole course. We have all seen changes of the

macula with the decided change of vision, and a case of this kind seems to throw great light upon their mode of origin.

DR. SCHNEIDEMAN: I forgot to say that the patient is a perfectly well young lady, and without history. The urine, repeatedly examined, was negative. Nothing was suggested as to the cause of the fundus lesion.

A NEW SERIES OF SEMAPHORE CHARTS FOR TESTING THE VISION OF RAILROAD EMPLOYEES.

BY NELSON MILES BLACK, M. D.,

MILWAUKEE, WIS.

THE author makes no claim to originality in using test cards with semaphore figures as the idea of using figures representing the various positions of the arms of a semaphore was advanced and put into practical use by Dr. Chas. H. Williams many years ago. His charts, however, are black figures on a white background, the portion of the figure representing the arms of the semaphore subtending an angle of 0° - $5'$ at 20 feet and at this distance "these signals will appear of the same size as a standard semaphore arm 46 inches long, seen against a sky background, at a distance of 2600 feet." They partake, however, more of the nature of an illiterate test chart.

The figures on the cards here shown are reduced by scale by Mr. L. R. Clausen, Signal Engineer of the C. M. & St. P. R. R., and represent at 20 feet a standard semaphore pole and arm seen at one-half mile (2640 ft.), with actual colors used for the distance and home signals, placed on a neutral grayish background, which corresponds to the average tint

of the horizon against which a semaphore in an ideal position is seen. In this reduced figure, at 20 feet, the arm of the semaphore subtends an angle of $0^{\circ}-5'$.

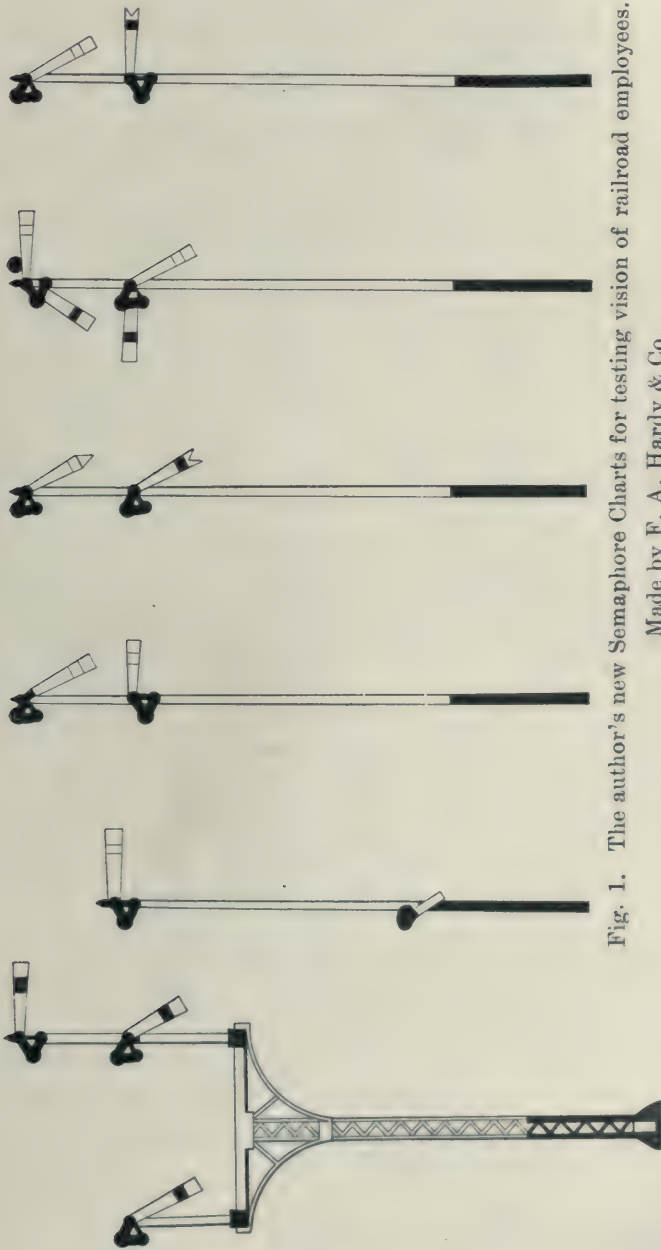


Fig. 1. The author's new Semaphore Charts for testing vision of railroad employees.
Made by F. A. Hardy & Co.

One card shows single blades in various positions; another various combinations of double blades, Fig. 1; a third represents a scale reduction of the Hall or disc signal in use on many roads for block signaling, Fig. 2.

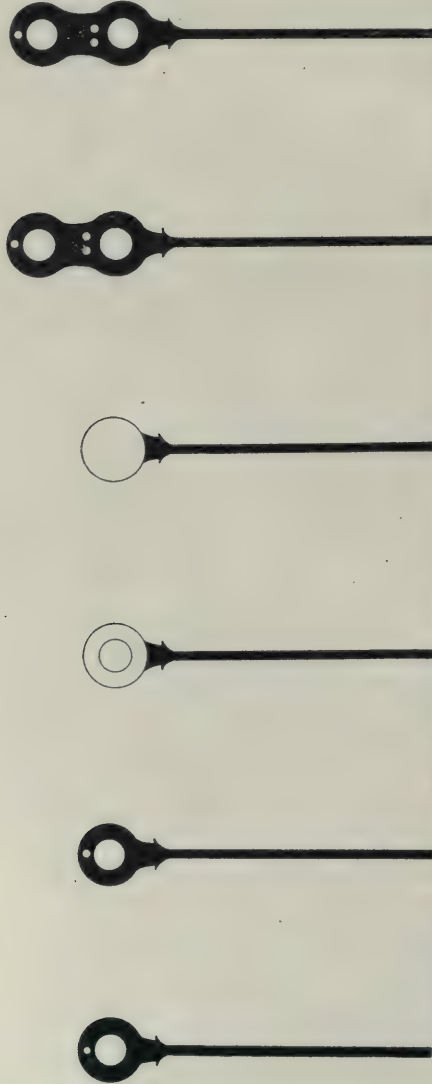


Fig. 2. The author's new Disc or Hall Charts for testing vision of railroad employees, made by F. A. Hardy & Co.
The center areas in the charts are colored red and green for various indications.

Many railroad men have remarked that Dr. Williams' sets of semaphore test cards fail to fulfill their intended sphere, as they do not resemble semaphores sufficiently.

The addition of the colored blades in this set has no special significance in cards No. 1 and No. 2, as the position of the blade governs the engineman, but as all semaphore blades are painted some color, usually red, green, or yellow, these figures were so colored to represent existing conditions. It will be noticed, however, that the blades have different ends, i. e., square, forked, or fishtail, pointed and rounded (concave or convex). These have a special indication, but at 2640 feet they can hardly be determined; the square end is usually used for home signals at interlocking plants and with the new style train order signal. The fishtail end for distance signals, and the pointed ends on some roads for train order signals.

With card No. 3, the color of the disc exposed gives the indication. With this card the person examined should not be required to name the colors, but should state whether the indication is *danger*, *caution* or *clear*. The reason for this is ignorance of the names of colors displayed by many men examined; they may be able to perfectly match the Holmgren wools, but if asked to name a color, are completely at a loss.

It would seem a good idea in using the Holmgren wool test in the examination of railway employes to have three boxes marked "danger," "clear" and "caution," and have the person examined place in these boxes all the various colors and shades of colors indicating such conditions to him. The results obtained would be the same as in matching the test skeins. Asking the name of the color in the lantern test should also be changed to requiring the one examined to state whether the color shown indicates "clear," "caution," or "danger." As many roads are using green for clear, and yellow for caution, the addition of various tints and shades of yellow should be included in the sets of test wools.

The reason for suggesting these changes in the methods of examinations is the fact of complaints made, not only by the men who fail, but those who pass the examinations successfully, that the methods are too severe and are entirely

foreign to conditions with which they meet in actual work, and a man will feel much better satisfied if turned down in an examination in which the methods bring into use the objects he comes in contact with and the terms he uses to express his findings. These methods, however, must be scientifically correct and the present high standard of requirements maintained.

DISCUSSION.

DUDLEY S. REYNOLDS, Louisville, Ky.: I think this an eminently practical paper, worthy of its author and worthy of this Academy which promulgates it. There has been too much that is technical but impractical, and it seems to me this does away with all the objections to other forms. It is practical, in accord with the signals in use, and does away with the requirements in discriminating the details of the different shades of color, with which very few people are familiar.

ALBERT E. BULSON, JR., Fort Wayne, Ind.: This paper is certainly a worthy supplement to the excellent paper by Dr. Black, presented at the last session of the Section on Ophthalmology of the American Medical Association. Those called upon to test the visual acuity and color sense of railroad employees should be very grateful to Drs. Black, Williams, and others who have been giving the subject such extended study, and who have advanced so much new and practical knowledge regarding the work.

The visual tests ordinarily employed in the examination of railroad men, and others who must be familiar with colored signals, are not adequate for the reason that the conditions under which the tests are usually made do not sufficiently correspond with the conditions presented in actual service. The appearance of a signal as seen by an engineer will vary with the changes in weather, quality and kind of light, back grounds, and many other influences. Therefore, in determining ability to distinguish signals the tests should conform in the largest measure possible to the conditions

presented in service. That many of the signals used in railroad service are poorly adapted to the purpose for which the signals are intended, seems thoroughly proven by the observations and investigations of Dr. Black, and his recommendations and conclusions should meet with favorable consideration at the hands of railroad officers.

One feature of importance in the tests of color vision is the determination of central color scotoma. An engineer or fireman who can sort out colored wools and by such tests pass a satisfactory examination may if tested with the perimeter present a well marked central color scotoma. Such a defect should at least create a doubt as to the fitness of the applicant for positions requiring quick and proper recognition of color signals.

EUGENE SMITH, Detroit: As bearing upon the advisability and desirability of doing away with the naming of colors, I have in mind the case of an old captain who had been forty years on the lakes and never had an accident, who came to me several years ago, saying he had been sent up for examination for color blindness. He could tell which was the port color and which the starboard, but he could not name red or green. I had to report him color blind. After forty years without an accident, he lost his position and he was incapacitated for anything else. He simply could not tell one was red and the other green.

J. A. DONOVAN, Butte, Mont.: Dr. Smith's experience recalls a case I had where the man was practically completely color blind. He had been on that road for 36 years as an engineer and one of the best men on the road. The superintendent did not like to let him go, and the chief dispatcher went over the road at night with him and again in the day time, and put him through every kind of a test and he never made a mistake, but he could not tell blue from red in my office. The chief dispatcher assumed the responsibility and he was retained.

DR. WÜRDEMAN (closing discussion): Dr. Smith and Dr. Donovan brought out that the final test should be made in the railroad yards and with the men at their work. While we hold that they should have perfect color sense and normal visual acuity, yet there are occasions in this vocation, in

which color scotoma may be found outside of disease and toxic amblyopia. The fireman, with the fire box open, looking into the fire every minute or two, when he closes the fire box cannot immediately see well in the distance, from blinding caused by the intense glare of the furnace. The wearing of the new amber protective glass, gives relief. I wish to add that Dr. Black has traveled over 6,000 miles in a railroad cab making these observations.

NOTES ON THE USE OF DIONIN.

THOMAS C. HOOD, M. D.,

INDIANAPOLIS, IND.

During the last decade the general therapist, and the specialist as well, has had laid upon his table numberless examples of the products of synthetic chemistry. Many of them have proven worthless and are forgotten. Some, while failing to measure up to the claim made for them, have, nevertheless, remedial virtues enough to warrant their addition to our formulary. Now and then a compound is met with, which arrests our attention at once by reason of its peculiar properties and profound effect. If these properties and effects, then, continue uniform and unvarying and are such as may be, with reason, applied to relieve and counteract certain pathological conditions, then we have a useful remedy which properly merits a place in our list. Dionin, I believe, belongs in this last category, along with argyrol, eucaine, holocaine and perhaps thiosinamine. It is a new drug in ocular therapeutics but its history has already been given to the profession and I shall not go into it further than to say that it is known chemically as ethylmorphine hydrochloride, a homologue of codeine, and that we owe its introduction into ophthalmic practice to Darier, who reports on it quite enthusiastically in his late book on ocular therapeutics.

He states, however, that the drug was first used in eye practice by Wolffberg of Breslau. Previously in general

practice it had been employed by Schroeder and Korte to combat the irritation cough of phthisis, chronic bronchitis and lung emphysema, proving, in their hands, superior to codeia. Wendell Reber and others have reported briefly on its use in diseases of the eye, and it has found favor with most of those who have made trial of it. The drug has not the power of producing local and superficial anæsthesia as do cocaine and holocaine, but is rather to be classed as a deep analgesic, with an action which is usually prompt and prolonged. Its effect is also considered to be to a marked degree resolvent and absorbent. If now we have in it a remedy which will relieve the intolerable pain in those ugly cases of inflammation of the iris and ciliary region alone, where atropine fails, as it sometime does, then certainly it must prove a very valuable addition indeed.

It has not only done this for me but it has in a number of cases, I feel sure, materially shortened the course of the attack and helped to remove lymph deposits and exudates, the usual debris which such inflammatory storms are prone to leave behind to cloud and perhaps permanently damage the vision. Its mode of action is still somewhat problematical, but there occurs, immediately upon the instillation of a three or five per cent. solution, a dilatation of the conjunctival capillaries and a marked increase in the current of the lymph streams and the size of their channels together with a very considerable transudation of serum under the scleral conjunctiva so that there is an appearance of chemosis, with a slight transitory smarting, which latter subsides in a few minutes. This transudation is presumably taken up by the larger superficial capillaries of the conjunctiva so that in the course of two or three hours the eye resumes, for the most part, its previous aspect. Whether the prompt relief from pain which follows its instillation, in most cases, is due to this sudden depletion of the deeper structures of the eye or to an obtunding effect upon the sensory nerve endings therein is not yet definitely made out, but the empirical fact is well established. It is readily soluble in water up to fourteen or fifteen per cent. and its solutions do not soon deteriorate.

I have not been able to note any difference in the effect

from 5 per cent. up, except in the matter of smarting. The stronger solutions hurt more.

A solution of 5 per cent. is probably the best strength to use and one instillation every twenty-four hours has ordinarily sufficed, in my experience.

The fact that its effect diminishes with each application has been observed, but I can not agree with the statement that its lymphagogue action is exhausted in two or three days. I have seen it produce the usual œdema and puffiness when used for the fifteenth time on as many consecutive days.

The reaction following its use varies in intensity with different individuals and it is always well to instruct each patient as to what the immediate and ultimate effects will be and somewhat of the rationale of its action, else they may be frightened and not return.

The summary of Reber is as good as any I have yet seen and coincides with my own experience so far as that goes.

1. It is an analgesic of no little power.
2. The action of atropine seems to be enhanced by it.
3. That it has upon the eye a powerful vaso-dilator and lymphagogue action.
4. That it is of value in promoting the absorption of exudations, deposits in the pupillary space, and of post-operative debris after cataract extraction.
5. That it helps clear up corneal opacities in some cases of interstitial keratitis.
6. That it seems without effect in all other forms of corneal opacity.
7. That its influence on the glaucoma process is yet unsettled.
8. That it should be widely used and the results reported in order that a final correct estimate of the value of the drug may be made.

The cases which I wish to report comprise two cases of marginal keratitis with ulceration (Abbott, Keefer), one case of interstitial keratitis following varicella (Perrine), three cases of iritis with complications (Bals, Cox, Perkins), two cases of post-operative trouble following lens extraction (Leisman, Smith), and one case of keratitis following severe lime burn (Dourman).

Case 1. Mrs. H. A., age 19. Health otherwise fair. Presented a small but rather deep ulcer at the limbus of the lower outer quadrant of cornea of left eye with an area of infiltration involving several millimetres of cornea and a corresponding area of episcleral thickening, no iritis. Treated by family physician for one week previous to consulting me, with one grain atropine and hot bathing which failed to relieve the severe pain and had no effect on the ulcerative process. Pupil only moderately dilated. Atropine sol. increased to two per cent. and ulcer touched with pyoctanin. Four days later, pupil fairly well open, pain somewhat less severe but patient still had to resort to morphine for sleep. Continued atrop. and hot fomentations. Applied Dionin Sol. 3 per cent. with entire relief from pain in half an hour and the relief was maintained by one instillation on every alternate day and at the end of ten days the ulcer was entirely healed while in five days more the eye was clear of all redness.

Case 2. Helen P., age 7. April 15th. Had Varicella two weeks ago. Right eye red and sensitive to light ever since, has marginal ulcer in lower and outer quad. Treat. Pyoctan. Atrop. 1 per cent. with an eye drop of boric acid and adrenalin for home use. This treatment was continued until May 17th, when the ulcer was entirely healed and the photophobia much lessened. All of the lower half of the cornea, however, had become more or less cloudy from exudate, with pin point spots of denser cloud, $V = 20/200$. Stopped atropine, prescribed Syr. Iodide of Iron, and began the application of 3 per cent. dionin every other day. June 1st, cornea clearing, treatment continued. June 14th, cornea still clearing. Dionin strength increased to 5 per cent. June 23rd, cloudy area reduced to two millimetres at lower border, $V = 20/40$. Patient left city and passed from my hands. No report since.

Case 3. Mrs. K., age 50. Was called to see this case which was in the care of a competent oculist of a neighboring city, and had received the classical treatment for two weeks with but little or no relief from the severe pain. The ulcer was large but not very deep and occupied the upper quad. of left cornea and there was a mild iritis.

Dionin 5 per cent. was added to the treatment. One week later a report from the doctor in charge stated that the

patient was free from pain and ulcer healing. A second report ten days later said ulcer was entirely healed and patient grateful.

(Note) Patient had a malarial toxæmia for which she was receiving the proper treatment, mainly quinine in large doses.

Case 4. Mrs. J. B., age 21. Feb. 16th, '04. Iritis with interstitial keratitis, right eye, beginning one week after a tonsillotomy which was followed by considerable reaction and very slow healing. No specific history obtainable. Had a uric acid diathesis. There was pain lachrimation and photophobia, with cloudy cornea R. V—10/200, L. V—20/20. Atrop. from family physician for one week lessened all the symptoms except the corneal cloudiness which was increasing. Atropine con. and K. I. gr. 15 t. i. d. added.

Mch 1st, cornea clearing. Stopped atropine and increased K. I. to 20 gr. t. i. d. V—20/120.

Mch. 10th, K. I. disagreed and patient discontinued it.

Mch. 20th. Patient returned with increased corneal trouble, V—20/200. R. Syr. Hydriodic Acid. Zi. t. i. d. and instilled dionin 3 per cent. every other day. Mch. 30th. Cornea clearing V—20/80. Treatment continued. Dionin increased to 5 per cent. Another relapse in May was controlled in the same way, and a course of salicylate of soda followed by urotropin has cleared up the case and the patient has now 20/30 vision, and a clear cornea.

Case 5. Ralph C., age 21. June 6th, '04. Iritis with ciliary involvement. Syphilis two years ago, mild attack, treated with mercury and K. I. Right eye became red and vision dim two weeks ago, V—20/80, L. V—20/15. Iris muddy. Pupil small and irregular, almost no reaction. Floating opacities in vitreous. Moderate pain in and about the eye in the last twenty-four hours. Has taken $7\frac{1}{2}$ grs. K. I. on his own initiative for a week. Hg. Protiod. gr. $\frac{1}{2}$ t. i. d. Instilled atropine 1 per cent. once daily. June 9th. Pain lessened, pupil irregularly dilated, treatment continued. June 12th. Much pain since the 11th, P. M. Iritis increased. Took one ounce of blood from the temple and added dionin 3 per cent. to atropine. Protiod. continued. June 13th. Eye quiet, no pain, treat. continued. June 18th. Eye clearing, Protiod. reduced to grs. $\frac{1}{4}$ t. i. d.

other treatment continued. June 29th. Eye clear. V—20/30. Atrop. and dionin discontinued for ten days, then dionin 5 per cent. for seven days.

July 20th. Eye clear V—20/20.

Case 6. Randolph P., age 24. May 10th, 1904. Irido-chorioiditis.

Has had dim vision in left eye for nine weeks. Consulted another oculist but did not follow his advice. Denies syphilis. Had acute rheumatism at six years. In Colorado eighteen months for weak lungs two years ago. Eye red, pupil irregular, vitreous cloudy, tension normal, a typical triangular deposit of lymph dots on the posterior surface of cornea, but little pain, L. V. 6/200, R. V. 20/20.

K. I. gr. 15 t. i. d. with daily instillations of 1 per cent. atropine and dionin. May 18th, improved. L V 15/200, no pain, treatment con. May 29th. Still improving, V 20/200, treat. con. and dionin per cent. increased to 3 per cent. June 10th, redness gone, vision remains at 20/200, lymph dots being absorbed, vitreous still cloudy. June 24th. Dots have disappeared, vision still cloudy, 20/200. Stopped atropin and dionin.

July 10th. Eyeball clear, vision still interfered with by large mass of exudate floating about the axial line of the globe. Ordered K. I. gr. 20 t. i. d. for fifteen days in each month.

Case 7. Mrs. Wm. L., age 69. March 14th, '04. Senile cataract. Left eye. Combined extraction, clear pupil, counted fingers, healing uneventful until the night of the fourth day when a neighboring brook flooded the house and room of the patient and resulted in an inflammatory reaction in the globe with an iritis which caused much pain and distress for ten days in spite of the usual treatment, filling the pupil area with much exudate and seriously endangering vision. 5 per cent. dionin was then added to the atropine solution and instilled once daily for fifteen days at the end of which time the inflammation had subsided and the pupillary exudate was largely absorbed so that a decision on May 23rd, gave the patient a vision of 20/80 with + 10. Ds.

Case 8. Charles S., age 72. May 24th, '04. Senile cataract R. E.

Combined extraction, clear pupil, healing progressed well until the seventh day when iritis developed with much pain, which was not controlled by atropine and wet cups and only yielded when a 5 per cent. solution of dionin was instilled. There was in this case little or no exudate and the final visual result was excellent. Tested on July 29th, V—20/30 with + 10 D. s. \subset + 1 D. c. ax. 180° and Jaeger I. with + 16 D. s. and the Cyl.

Case 9. Carrie D., age 50. June 17th, '04. Both eyes burned by freshly slackened lime—the left more severely. R. V.—fingers at one foot. L. V.—P. l. Both the ocular and palpebral surfaces involved.

Both corneal surfaces were parboiled, the left one worse. There was swelling of the lids and chemosis—but surprisingly little pain. The usual treatment was applied and the inflammatory reactions all subsided in four weeks—but the corneae remained cloudy and the vision poor. Dionin was then used for three weeks at the end of which time R. V. was 20/30 and the left cornea had cleared so that V—20/200.

These cases do not prove much perhaps but I submit them for what they are worth towards settling the status of this remedy.

There are two other classes of cases in which, theoretically this drug ought to be of some service, when we consider its peculiar action.

They are, first, glaucomatous conditions, and, second, those forms of cataracts in which the initial degenerative changes take place in the superficial fibers of the lens and which are characterized by the well known striæ of opacity seen extending from the region of the equator toward and into the pupillary area.

The reports of results from its use in glaucoma are, so far as I know, negative, but it deserves a more extended trial.

If cataract of the lens, particularly the form just referred to, is the result of diminished and insufficient nutrition, then this remedy with its stimulating and lymphagogic action ought to assist in restoring the normal tissue metabolism.

I have under treatment and observation a few such cases but they are as yet too recent to report upon.

DISCUSSION.

A. ALT: It seems strange to me that dionin produces nothing but good results, in the hands of all reporters and in all diseases of the eye, and I must feel sorry that I have not used it oftener. But in the few cases in which I have used it, I was so discouraged that I have been almost afraid to use it again. For instance, I used it in a case of iritis. The man was suffering intense pain and I told him I had something that would quickly relieve him. I instilled myself and I gave him a 5 per cent. solution to use at home before going to bed; but instead of obtaining relief, he stated that he had much more pain than ever before, and begged me never to use that remedy again. Why this should be, I do not know. I made the solution myself. If dionin always acts in the way the doctor says, I can not comprehend why in this and several other cases it caused such great pain, even worse than the disease itself. The reader of the paper, also remarks that it might do good in cases of beginning cataract. How that can be possible I cannot understand. As soon as you see well marked striæ in the lens you have to deal with dead tissue. We cannot replace this dead tissue by normal lens fibres.

ALBERT E. BULSON, JR., Fort Wayne, Ind.: I wish to agree with the essayist in the statement that the use of dionin in certain diseases of the eye is a distinct advance in ocular therapeutics. As I have already stated in a recently published article in the *Ophthalmic Record*, I am not as enthusiastic as Darier regarding the sphere of usefulness of dionin, but I believe that the remedy is applicable in the treatment of a certain class of cases, and in a few affections will be found more beneficial than any other one therapeutic measure.

The application of a five per cent. solution once in twenty-four hours, as employed by the essayist, is altogether too inefficient and I do not think will produce desired results. In fact, the history of the cases reported by the essayist do not indicate that the characteristic dionin effect was obtained, and the results secured could just as well be attributed to the other treatment employed. To obtain the best and most satisfactory effect from dionin a solution of not less than ten

per cent. in strength should be employed and the instillations should be made once in every one, two, or three hours according to reaction produced. As Darier has already pointed out, unless you get the characteristic infiltration and marked chemosis of the ocular conjunctiva, the action of the drug is practically nil. It has been my experience, and I have used dionin quite extensively, that when chemosis of the ocular conjunctiva does not occur, no benefit can be expected from the use of the drug.

Some patients and even some diseases seem more affected by dionin than others. In some cases even the pure powder seems to produce no appreciable reaction, and in some diseases even with the reaction no beneficial effect upon the inflammatory or degenerative process can be noted. I do not believe that it has any beneficial effect in cataract or degenerative affections of the chorioid or retina. For the promotion of absorption of exudates in the pupillary area, in the anterior chamber, or even in the vitreous, I believe it has a positive action which has been demonstrated to a certainty. In the various forms of keratitis the beneficial effect is questionable. In conjunction with atropine in the treatment of iritis, particularly when the pupil is more or less occluded and adhesions are stubborn, the results are generally marvelous. It not only favors dilatation of the pupil by promoting absorption of exudates, but has a distinct analgesic effect and limits or controls pain. Its analgesic effect also makes it of service in conjunction with eserine in the treatment of glaucoma. Its effect in promoting absorption makes its use after cataract extraction advisable if any cortical matter has been left. The solutions employed, however, should not be too weak if good results are to be secured, and care should be taken to obtain a reliable preparation, as therein lies the secret of success without ill effects.

To one unaccustomed to the effects of dionin the chemosis of the eyeball and lid, which at times is very marked, may appear to be dangerous, but no disastrous results need be feared. It is the lymphagogenic effect which is worthy of our recognition, but even if it had no other effect than that of an analgesic, it would prove a valuable addition to our

therapeutic resources in the treatment of many painful eye affections.

EUGENE SMITH, Detroit: I thought we had found a remedy when I read of this, but my experience is like Dr. Alt's in the hospital and in private practice. My patients all complained bitterly of the extreme suffering following a 5 per cent. solution, which lasted for hours. I imagine in one case I got some relief of the opacity. I probably did not use it long enough, but three or four weeks use caused me to throw it aside. In every instance I got the marked chemosis and such pain that the patients begged me not to use it. I used cocain previous to the use of dionin, and never found the slightest analgesic result, but the reverse. I have experimented for two or three months, as did my assistant, and we both cast it aside.

J. C. BUCKWALTER: I have had some experience, having used dionin on two different cases of glaucoma, and in both cases the pain produced was so severe that they could not continue the use of it. I ordered a 5 per cent. solution to be instilled every two hours. I performed a cataract operation, the results were perfect the first three days; after that the vision disappeared. The strength of atropine was increased from 1 to 2 per cent. to be instilled every two hours and hot applications made every two hours to continue for five minutes. This was kept up for three weeks with no improvement in vision and no clearing up of the exudate in the anterior chamber. I then ordered a 10 per cent. solution of dionin to be instilled every two hours for four days. The opacity cleared and the patient could count fingers at three feet. I have used the 5 per cent. solution in three different cases of macula of the cornea without perceptible improvement.

DR. BRIGGS: Some three years ago when Darier first published records of the efficacy of dionin, I used it extensively for some time, but I was a little sceptical, because I saw a number of other reports which seemed to prove it useful in almost every eye disease. When one finds a remedy vaunted as almost a universal medicine, he can generally conclude that it is not very useful for any disease. I have gradually used it less in the last year than I did the first year

that it was introduced and have restricted it of late to use an analgesic in cases of iritis. I occasionally use the powder, applying it to the cornea. My experience has been that it had very little influence on lesions of the cornea, but I do believe it is occasionally very beneficial in its effect on the pain of iritis. Its action is not uniform, in my experience, but it is so frequently disappointing that I have used it less and less.

GEO. F. SUKER: The efficacy of dionin in glaucoma is in proportion to the amount of tension. The pain caused by it depends largely upon its purity. The bi-products are often irritating and, unless chemically pure, it will cause a considerable amount of pain. The purest will cause some pain, but not more than some other solutions we use at the present time. It should be preceded by cocain. It does enhance the efficacy of the dilating property of atropine, especially so in syphilitic iritis with adhesions. It materially aids in absorbing the exudative materials. In cataract extraction where you have a cloudiness left in the anterior chamber because of flocculent lens remains, application of it does enhance the absorption because it is a decided lymphagogue. I use one drop of cocain first and then the 5 per cent. solution of dionin—never stronger than that—a drop every hour or so, into the conjunctival sac, until there is a marked chemosis, and then add one more drop for safety. Then I allow the patient to rest and, if necessary, apply iced compresses to counteract the extreme chemosis. As to its analgesic effect, I am undecided. As regards its lymphagogic action, it is certainly a decided addition to our therapeutics in ophthalmic practice.

H. V. WÜRDEMANN: The testimony given by the several deponents in this case seems to show that this affiant, dionin, is on trial for its life. My experience with it for the past two years is that it is a positive analgesic, antiseptic, local alterative, and a lymphagogic of strong action. Its effect is only to be gained in strong solutions of the pure drug applied frequently. Its affect passes away and cannot be obtained again for three or four days, so that we have to have an interval before we can get an effect with this drug again.

This effect depends upon the amount of reaction we get, the amount of chemosis or exosmosis produced.

MELVILLE BLACK, Denver: I am skeptical about the value of a new drug, and I am like the man from Missouri, "I've got to be showed." But I have been agreeably disappointed in dionin. It certainly has met the claims of those who have been its strongest advocates. I am surprised there should be this extreme difference of opinion. Those who have been disappointed in it seem to have gotten no results at all, while others find it a very valuable agent. However, we all differ in the way we use drugs, and drugs differ in their strength, in accordance with the manufacture. It would seem that those who are getting results are using a different preparation from those who get none or are using it differently. Würdemann has struck the key-note when he says the greatest effect is in the beginning. If one watches it closely he will find the greatest chemosis from the first application. The chemosis gradually subsides and becomes less and less in subsequent applications. It seems to me every two hours is too often to use the drug, because we do not get complete recession of the chemosis in the interval and in consequence the drug soon ceases to produce any reaction. I use it every five or six hours for a number of days. As soon as it ceases to cause reaction, stop it for a few days, and then begin its use again. We will get a more prolonged action if it is not used too frequently. It seems to me it would be well to bear this fact in mind, that if you wish to prolong the action of this drug, you must not use it every two hours. In chronic cases I have used it two days on and two days off. By so doing the reaction it produces can be seen for several weeks.

J. M. RAY: One point in connection with the use of dionin brought to my mind by the last two speakers is in regard to the thickening of the conjunctiva, while the chemosis will disappear in a few hours, there is a soggy, water-logged appearance of the conjunctiva for several days. In several cases I have seen a certain amount of extravasation of blood into the tissues under conjunctiva, and this remains a day or two.

DR. HOOD (closing discussion): I did not wish to convey the idea by these few cases reported that dionin is a cure-all. It is not. Only perhaps three or four classes of cases were represented by the cases reported, and the point mentioned by my friend Dr. Bulson in regard to testing the susceptibility of the eye of the individual is one I would emphasize. You must have the chemosis or there is not much effect, analgesic or otherwise. I feel gratified that the paper elicited the full discussion that it has. I think we are advancing in our knowledge of this drug, and I hope the reports we may get will soon settle its status.

SOME UNIQUE CASES OF AMBLYOPIA.

DR. T. W. MOORE.

HUNTINGTON, WEST VA.

At the time I selected this subject, I did so to report three cases of transient amblyopia without fundus changes occurring in children between the ages of ten and eighteen, presenting no special features of nervous debility and without neurotic family histories.

Since that time Dr. L. Webster Fox has reported several cases of the same type under the title *Anaesthesia of the Retina*, in a paper read before the ophthalmological section of the American Medical Association. His patients were all young girls, who were healthy and all were cured after a few applications of the constant electrical current.

Case 1 of my series came to me in March, 1903, complaining of having suddenly lost her vision, being unable to see either far or near, and having been compelled to give up her schoolwork on this account. I found a healthy, active, full blooded girl, aged eleven years. Pupils reacted normally, vision in each eye = 10/200, accepting no lenses. Under

atropine, vision remained the same, but with a $+ .50 \text{ C} + .50$ cyl. ax. 90° over each eye she read 20/80. Her field for white was contracted in all directions as it was for colors, the normal relationship being retained, a second examination at this time remained practically the same. The media and fundus were normal in both eyes.

I gave strychnia, and iodide of sodium, with instructions for patient to return in three weeks. I received word that she was much better but did not see her again until December, when I found her condition practically unchanged. This continued until after my return from the meeting of the American Medical Association, when I began using the galvanic current for five or six minutes daily, the sponge electrode being moved across the forehead and over the closed lids and temples. Her vision when I began treatment was R. E. 10/150; L. E. 5/150, she being unable to read 11 Jaeger near. I tested her with different cards at different distances and obtained always the same results, although she did at times complain of being unable to see anything, but after a few minutes rest she would read the letters to the limit of her vision. On June 23rd, 1904, after using the current five minutes, vision improved from 14/200 in R. E. to 20/200; in L. E. from 7/200 to 10/120. On June 24th, after using the current five minutes the vision was the same as the day before. On June 25th, after using the current five minutes vision = 20/80 with both eyes. Patient was taken to the country on this date, returning on the 30th, when after using the current five minutes she read 15/50 with both eyes. On July 2nd, after six minutes treatment she read 15/20 with both eyes; on the 5th 15/15, on the 7th 15/15 +, reading Jaeger 1 at twelve inches. Fields normal. Repeated measurements of the field of vision showed that there was an increase in all directions as the vision improved, the field for red increasing also but retaining its normal relation in the left eye, but in the right eye the field was never as much contracted as in the left, retaining almost its normal size at all times.

Case 2.—S. P. Schoolgirl, aged 17, came to me in January, 1903. Vision, R. E. 20/200; L. E. 20/120, unimproved by glasses. Retinoscopy showed the refraction to be $+ .50$

sp. R. E.; + .25 sp. L. E. Patient went to the springs and returned with vision, R. E. 20/120; L. E. 20/40, this was eight months later. One month later with + .50 vision = 20/30 in each eye. There was at no time any abnormality in the media, the only symptoms being failure of vision, sensitiveness to light and the contracted fields.

This case was of especial interest to me because a brother six years before had been examined by a well known ophthalmologist who made a diagnosis of disease of the optic nerve that would lead to total blindness in a short time, and to my knowledge the patient had to be led about for several months, and was finally cured by "blood medicine" compounded by an uncle who calls himself an eclectic.

Case 3 was a boy aged ten, inclined to be nervous without any special manifestations. Parents healthy as are his brothers and sisters. No headache, vision suddenly failed so that he was unable to study, vision = 20/40 unimproved in both eyes when first seen, June 7, 1902. A few weeks later his vision was 20/20 both eyes—three letters. On August 21, it was 20/60 both eyes, nine days later it was 20/30? both eyes. One year later he was no better. His fields were contracted when the vision was bad, the normal color relationship being maintained and normal when he read 20/20. Ophthalmoscopic findings were at all times normal.

Heretofore, gentlemen, it has been the custom of ophthalmologists to classify these cases as belonging to that symptom complex "hysterical amblyopia," and as that term has been used to designate every visual defect that could not be explained by pathological findings—I suppose that it is the correct one—and further it lessens the shock to our sensibilities by having it gradually dawn upon us "that there is something wrong and we do not know what it is."

I wish to emphasize a few points in my cases in which they differed from the usual hysterical manifestations.

First, the fields for white in these cases have varied with the visual acuity instead of being contracted disproportionately, and the color limits have retained their normal relationship instead of being reversed as they so frequently are in the neurasthenic types.

My cases as well as those reported by Dr. Fox all oc-

curred between the ages of ten and eighteen years—the ages when hysterical symptoms are most prone to manifest themselves, and whilst all of his and two of my cases were in females, it is known that the members of that sex do apply themselves to their books more assiduously than their brothers.

Hysteria is so frequently monocular, in these cases both eyes were involved and to almost the same degree.

I made very careful tests in Case one to determine as to the counter field described by Wilbrand and found it absent, and further the fact that my cases and those of Fox occurred in young subjects and not in hysterical women with ovarian and uterine disorders, as he states his cases were most frequently found.

If neurasthenia is abnormal susceptibility of the system to fatigue from mental or bodily exertion, this broad term may express the origin of this condition which I believe to be an arrest of the functional activity of certain retinal cells occurring at or about the time of puberty, when the entire nervous system is at high tension and when with our forcing system of education the eyes are apt to be overworked, more particularly in those subjects who have slight refractive errors for the reason that they receive no warning in the way of headaches, etc.

The remedy for this from Fox's report and my experience with the one case, after other measures had failed, is the constant current which seems to stimulate these torpid cells into renewed activity.

I do not think that retinal anæsthesia is a good term owing to its use by different authors for varying conditions none of which were in accord with the symptoms here described, Retinal Torpor might be a better one.

COFFEE AMBLYOPIA.

BY ALBERT E. BULSON, JR., B. S., M. D.,

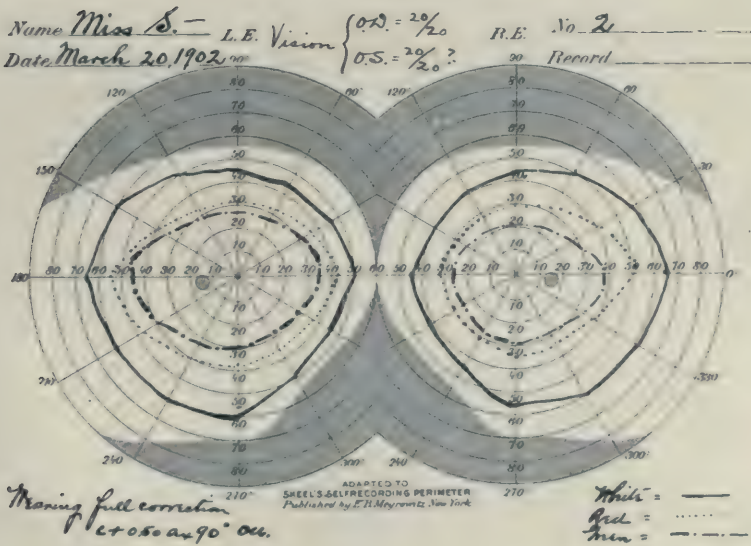
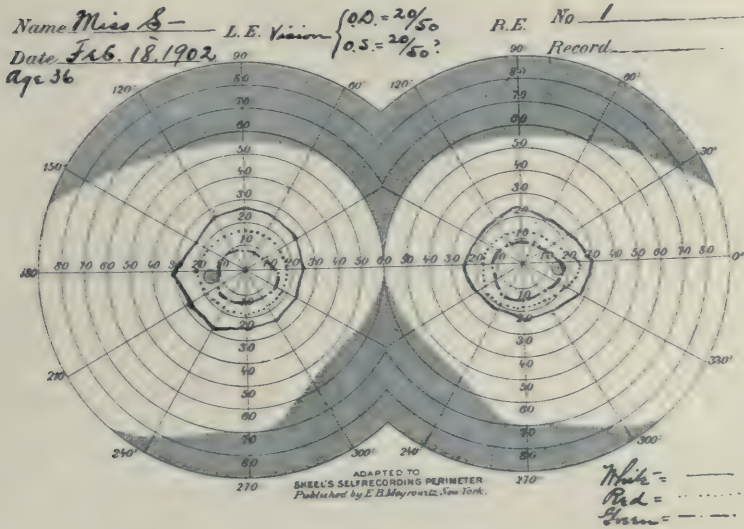
FORT WAYNE, IND.

Among the substances which may, through toxic action, produce amblyopic symptoms, unaccompanied by demonstrable retinal or optic nerve lesions, coffee may be included, though ophthalmological literature contains but few and brief references to the subject. Among modern writers de Schweinitz (1) Ball (2) Wood (3) and a few others mention coffee as capable of producing toxic amblyopia, but no particulars are given. Hutchinson (4) reports having seen a case of coffee amblyopia which resembled quinine amblyopia, while Wing (5) reports in full, with perimetric charts, the history of an exceptional case of coffee amblyopia in a patient but eight years of age.

The experiments and observations of the writer seem to warrant the belief that visual disturbances of mild form as a direct result of the use of coffee are relatively more common than generally supposed, and that pronounced amblyopia, with contracted visual fields, in those who use coffee to excess, is not a rare condition.

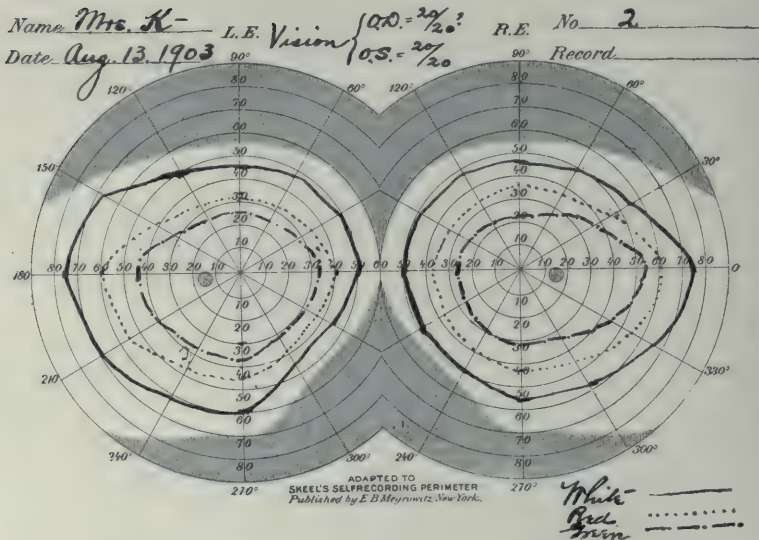
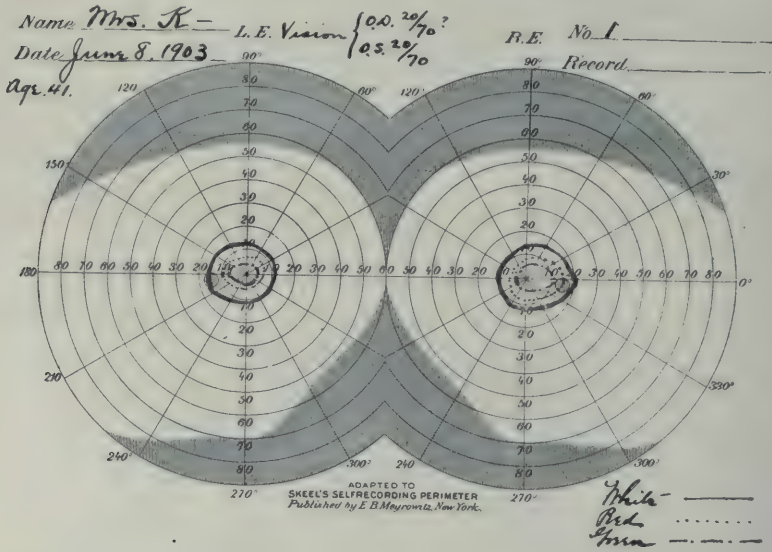
The manner in which the visual disturbance is produced is somewhat in doubt, though the theory advanced by Casey Wood (6) that it is occasioned by a ptomain poisoning generated as a direct result of the injurious influence of excessive quantities of coffee taken into the system, seems worthy of acceptance. While Luederitz (7) Rabateau and several other observers have been able to definitely establish the fact that infusions of coffee have the power to destroy various pathogenic and non-pathogenic micro-organisms, and when taken internally in certain quantities act as an agent to restrict the growth of pathogenic organisms in the intestinal canal, it is equally an established fact that the excessive use of infusions of coffee produces a marked irritation of the digestive tract, thus favoring the processes of decomposition

and disintegration essential to ptomain development, and this is more particularly true in those persons having a particular



susceptibility to its effects. That the ptomains thus generated, acting through the circulation, may produce nutritive changes in the ganglion cells of the retina, or an affection of

the optic nerve, or both, seems a reasonable supposition as to the genesis of the visual disturbances accompanying the excessive use of coffee by certain persons.



The writer's attention was first directed to the subject of amblyopia as produced by coffee by the following case:

Miss S—, dressmaker, age 36, consulted me Feb. 18,

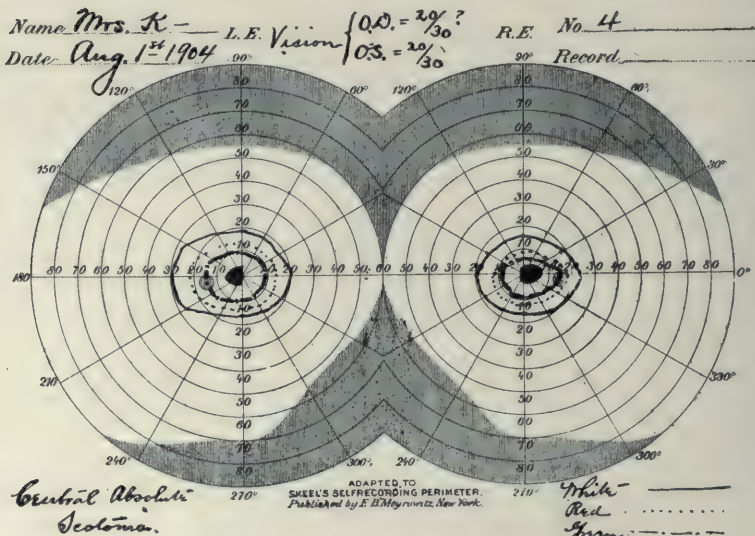
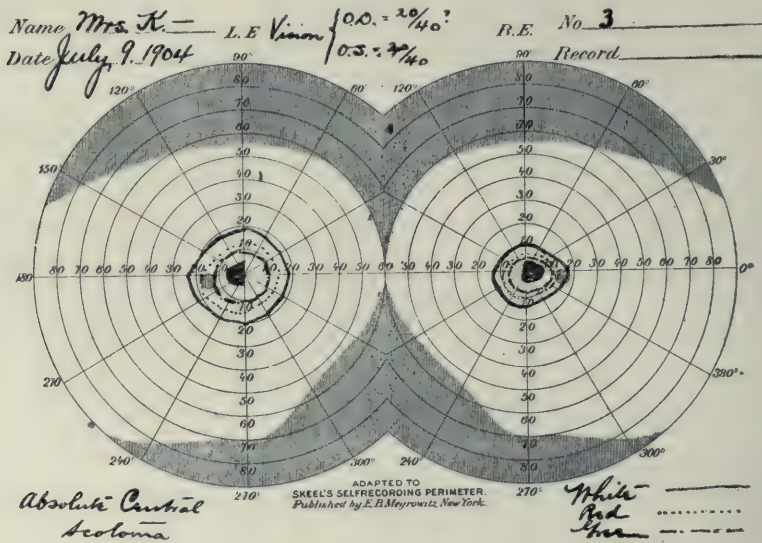
1902, with a history of failing vision dating back three months. On the supposition that glasses were all that was required for relief, a local optician had prescribed concave sphericals of one-half dioptré but without beneficial effect. On examination vision was found to be 20/50 each eye, and not improved with lenses. Conjunctiva, cornea and iris normal. Ophthalmoscopic examination negative. A test of the field of vision disclosed concentric contraction of the field in each eye for all colors, as indicated by the perimeter chart, but with no discoverable scotoma.

Upon questioning the patient the fact was brought out that for several months large quantities of strong coffee, averaging ten or twelve cups per day, had been drunk, much of it during working hours when it was taken in place of the mid-day meal. The patient also suffered from poor appetite, disturbed digestion, constipation, and marked nervousness. Headaches and attacks of "dazzled vision" were of almost daily occurrence. Examination of the urine negative.

The patient was directed to totally abstain from the use of coffee, and was given pilocarpine sweats, and daily hypodermic injections of strychnine in increasing doses, beginning with 1/20 grain. At the end of one week the vision had increased to 20/30 plus, and the fields had decidedly widened. At this time the pilocarpine treatment was discontinued, but the strychnine was continued in doses of 1/20 grain, in tablet form, after each meal. At the end of four weeks the fields of vision were approximately normal, and vision 20/20 each eye. The digestion and condition of the bowels had also improved. Patient then disappeared from observation and was not again seen until four weeks ago when she returned by request for report as to condition. There has been no return of the trouble. The use of coffee has not been resumed.

A more definite proof of the fact that coffee may be responsible for visual disturbances was found in the history of the following case in which a relapse occurred as a direct result of the resumption of the use of coffee:

Mrs. K., housewife, age 41, consulted me June 8, 1903. She reported that for several months she had noticed im-



paired vision but that the condition had grown much worse during the previous three or four weeks. During the latter period she had suffered from nervousness, headaches, poor

appetite, and indigestion. Also complained of attacks of violent twitching of the eye-lids, accompanied by spots before the eyes. Patient reported that for two or three years she had been accustomed to drinking large quantities of strong coffee which she took at varying intervals during the day from the coffee pot which was constantly kept filled and on the stove. She said she depended upon coffee to sustain her.

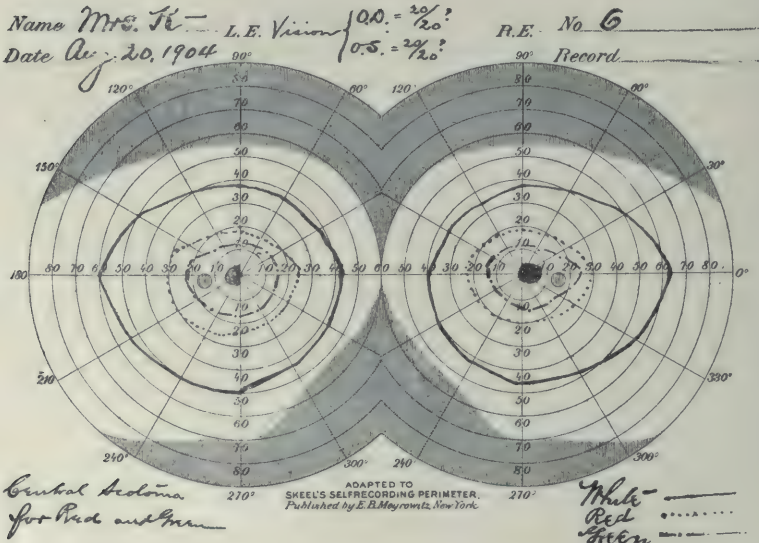
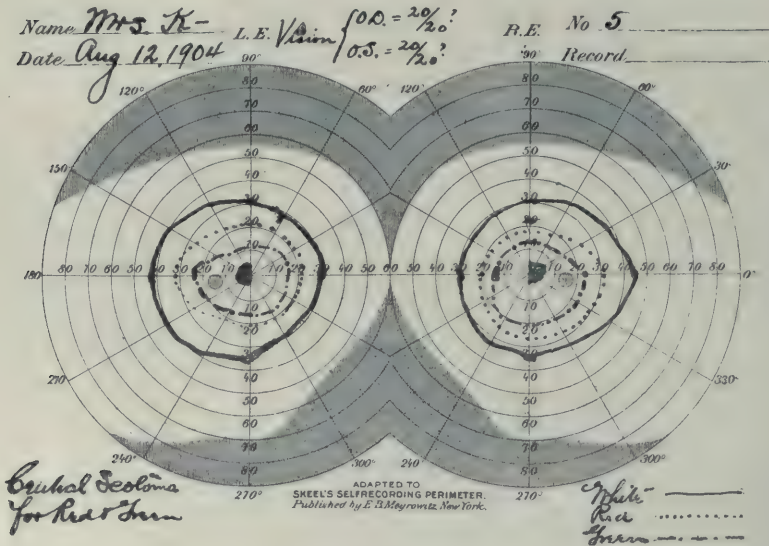
On examination both eyes were found fairly normal in appearance, with the exception that the pupil reacted a little slowly to light and accommodation. Vision 20/70 each eye, and not improved with lenses. Media clear. Fundus of each eye presented a slight pallor of the temporal half of the disc, and haziness of the edges, but otherwise normal. Field of vision in each eye decidedly contracted concentrically for all colors, as indicated on the perimeter chart, but no scotomata. Examination of the urine negative.

The patient was directed to abstain from the use of coffee, and pilocarpine sweats and strychnine were prescribed. Under the treatment the vision steadily improved and the fields of vision widened until on August 13th, when the patient was discharged, the conditions were essentially normal.

The patient was not seen again until July 9, 1904, when she returned complaining that her vision had within two or three weeks become affected much as it was at the time of the first consultation over one year before. She reluctantly admitted that for two months she had been drinking coffee again, and of late the quantities nearly as large as formerly. There had also been a return of the headaches, eye pain upon use of the eyes, and "flashes of light." Vision 20/40 each eye, and fields contracted essentially to the same extent as in the former experience. At this time a small absolute central scotoma was discovered.

The patient was again placed on treatment consisting of pilocarpine sweats, strychnine, and abandonment of the use of coffee. Improvement was slower than in the first attack, and at the end of three weeks vision had only increased to 20/30, fields of vision had not widened to any great extent and the central absolute scotoma persisted. At a recent

examination, Aug. 12, 1904, the vision was 20/20 minus in each eye, the fields of vision increased to about one-half



normal, and the central scotoma changed to one for red and green only. The patient is continuing the same treatment, with the addition of potassium iodide in 15 grain doses.

In view of the discovery of a small central scotoma in the last case during the second attack, it is reasonable to presume the possibility of the existence of a similar manifestation during the first attack, and perhaps also in the first case reported, but overlooked owing to lack of extreme care in the perimetric examination.

These two cases of coffee amblyopia, coming under observation within a few months of each other, led the writer to undertake a series of experiments upon himself, and observations with reference thereto, as to the toxic effect of coffee upon the visual apparatus. It had long been known that the subject was particularly susceptible to the influence of strong coffee in certain quantities not usually considered excessive. An attempt was made, therefore, to induce, if possible, a mild coffee amblyopia. Beginning with the addition of four to six cups of strong coffee to the usual allowance of one or two cups of moderately strong coffee taken at the morning meal, the quantity taken per day was rapidly increased until it exceeded twelve cups. At the end of two weeks the use of coffee was discontinued on account of excessive nervousness, persistent insomnia, anorexia, gastro-intestinal disturbances, and dull headache. During the first week of the test nictitation developed and increased in persistence until at the end of an additional five or six days it became almost unbearable, and undoubtedly contributed to the general nervousness. There were also asthenopic symptoms upon prolonged eye-work. Visual acuity was not affected until the day the test was abandoned, when the usual 20/15 vision for each eye was found to be barely 20/20. The field of vision in each eye however, was found contracted concentrically to an appreciable degree three days before the use of coffee was abandoned, and the contraction slightly increased during the succeeding three days. Careful and painstaking perimetric examination failed to disclose the existence of scotomata. Only two fundus examinations were made, by a confrère, and at neither examination could there positively be detected any injection of the retinal vessels, though the temporal half of each disc appeared to have a slight pallor and the edges of the discs were somewhat hazy. With the suspension of coffee drinking the disagreeable symptoms disappeared, but

return to normal conditions was probably hastened by strychnine 1/20 grain, three times per day, which it was deemed wise to take in view of the general nervous debility existing.

A peculiar feature in the experience was the quieting effect which tobacco had upon the irritable nervous system. When affected with a general nervousness which precluded the possibility of being quiet for even a short period of time, the smoking of a cigar had a decided quieting effect. The possibility of tobacco being a factor in the case is recognized, but in view of the cessation of the ocular manifestations following the withdrawal of the coffee, it seems reasonable to suppose that the coffee was responsible for the mild amblyopia.

Hutchinson reported that his case resembled quinine amblyopia, in which case there presumably was marked contraction of the retinal bloodvessels and pallor of the discs. In Wing's (9) case there was congestion of the optic discs, enlargement of the retinal veins but contraction of the arteries. In the two cases observed by the writer, one of which was seen during a recurrence, no perceptible contraction of the retinal vessels could be distinguished, and aside from a slight pallor of the temporal half of the discs and faint haziness of the edges of the discs there were no fundus changes discoverable by ophthalmoscopic examination.

It is presumed that with more extended observation in a larger number of cases the manifestations will vary, much as the manifestations vary in tobacco amblyopia. The more important point to be considered is the recognition of the possibility of coffee being the cause of a toxic amblyopia as well as many of the asthenopic symptoms which at times seem of obscure origin. Considering the almost universal use of coffee as a beverage it is thought that cases of coffee amblyopia are not relatively uncommon, but when occurring will be found in persons particularly susceptible to the toxic influence of coffee when taken to excess. It is also thought by the writer that women, with their more sensitive nervous systems, mode of living, and increased tendency to use such beverages as tea and coffee to excess, will be found most often suffering from the affection. Such cases, judging from observations made, will probably be also accompanied in nearly every instance by gastro-intestinal disturbances,

and various neurasthenic manifestations not the least of which will be asthenopia.

Treatment of the condition is obvious. The use of coffee should be discontinued. Elimination by means of the pilocarpine sweat seems of undoubted value, and this should be supplemented with strychnine internally in fairly large doses. The latter should be increased to the point of tolerance if central vision does not rapidly improve and the fields of vision widen. In the less pronounced cases discontinuance of the use of coffee alone may be sufficient to bring about improvement, and especially if proper dietary and hygienic regulations are followed.

Judging from the second case here reported it would seem that coffee amblyopia having once occurred, relapses may be occasioned by resumption of the use of the beverage in even moderate amounts.

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DISCUSSION.

DR. BRIGGS:—I have always called such cases as Dr. Moore describes hysterical amblyopias. I have usually seen them in school girls in debilitated condition from over study, and too little out-of-door exercise. In regard to the case spoken of by Dr. Bulson, I am very glad to hear the report, because it opens a new field. We have certainly overlooked a great many cases in the past. There are so many poisons taken into the human system as beverages or in some other form, alcohol, tobacco, coffee, and tea, that produce various nervous disturbances, and the nervous affections of the eye, I believe, are not infrequently produced by strong coffee and I have no doubt that coffee, even in small quantities, will have a more or less debilitating effect on the nervous system.

I saw a patient last winter some time who had during the evening that he was engaged in writing a paper, taken three cups of very strong black coffee, and in the night some time was taken with total deafness in his left ear and loss of power of locomotion. Whether the coffee had anything to do with the affection of the semi-circular canals is a question in my mind, but I have considerable leaning to the view that it may have precipitated the attack.

DUDLEY S. REYNOLDS: I think it was at the Cincinnati meeting of this Academy the subject of hysterical amblyopia was discussed, and I reported some cases occurring in my own practice which seemed to me were due to auto-intoxication, and I have since then had the opportunity of seeing a very strikingly illustrative case. I would like to suggest to Dr. Moore that he add the bitartrate of potassium to the pilocarpine treatment, and he will find more rapid recovery. I have lost confidence in the medical treatment of hysterical amblyopias engineered by disturbance of the genito-urinary apparatus in women. As to the effects of coffee I have reported several cases, and one striking case I have alluded to a number of times, and beg pardon for referring to it again. A lady about 42 years old, became gradually more and more amblyopic; the retinal arteries became contracted, the discs pale and the veins injected and at times tortuous. There were, also, ataxic symptoms and locomotion without a cane was finally impossible, and she gradually became so nervous as to take to her bed where she remained four or five years, refusing to give up coffee, and finally died with just enough light perception to enable her to distinguish large bodies, or the shadows of people walking through the room.

J. J. KYLE, Indianapolis, Ind.: I believe we have a great many cases of anaesthesia of the retina not dependent upon systematic conditions, diseases, neurasthenia, etc. I have had cases under observation, especially in women who suffered from painful affections of the eyes, which reacted quickly on the local application of electricity the negative pole to the eye and the positive pole to the neck. These were typical cases of amblyopia, not dependent on systematic conditions, and I think, as Dr. Moore says, we must differentiate between the different anaesthesias, as it were, of the retina.

GEO. F. SUKER: The term hysteria, in its broad sense, is a misnomer. It is hardly consistent with our conception of things to have a functional disturbance without some organic change somewhere. The idea of idiopathic disease is being rapidly eliminated from our category. With reference to the contracted field, as spoken of by Dr. Moore, I think the gun barrel vision described by Graefe of Berlin, corresponds to Dr. Moore's case. I think there are cases where you can have a concentric contraction for form and color (without inversion) and yet the acuity be reduced. I think that the field of hysterical amblyopia needs further investigation than we have given it up to the present day. In regard to Dr. Bulson's paper, kindly pardon a personal allusion; I am a confirmed drinker of strong coffee, and can vouch for the fact coffee does often produce an amblyopia. When I drink it to excess, a good, strong cigar has the same effect upon me that Dr. Bulson sets forth in his paper.

DR. MOORE (closing): I have very little to say, except as I understand it the usual hysterical field for red is increased or normal, whilst that for white is contracted. In my cases the fields for both colors were contracted proportionately with the visual acuity, retaining their normal relationship. This was also true of the cases reported by Fox, all of which yielded to the galvanic current.

DR. BULSON (closing): I regret that the cases of coffee amblyopia reported by Dr. Reynolds did not come to my notice. I found in the literature at my command but little reference to the subject of coffee amblyopia, and what I did find was meager and devoid of particulars. Had I found any reference to Dr. Reynolds' cases I certainly would have mentioned the fact in my paper.

We are beginning to recognize certain toxic amblyopias which formerly escaped our attention, and I believe we will eventually distinguish coffee amblyopia as one of the relatively common amblyopias, even though the alteration in the state of the vision in the majority of such cases is slight. The two cases observed by me did not bring out any specific symptomatology other than the amblyopia and the contraction of the fields of vision. It is likely, however, that eventually we will have a series of manifestations which definitely

point to coffee as being the cause of the trouble, just as we recognize by certain manifestations the amblyopia from tobacco, hysteria, etc. In one of my cases the diagnosis was made largely by exclusion, and in the other the diagnosis by exclusion was strengthened by the recurrence of the amblyopia when the use of coffee was resumed.

In experimenting upon myself I took advantage of a long recognized sensitiveness to the effects of strong coffee. For several years I have not been able to drink coffee at the evening meal without suffering from wakefulness during the early part of the night. The production of visual disturbance seemed possible, and with that end in view the experiment was undertaken. No doubt the amblyopia produced would have been more pronounced had the use of coffee in large quantities been longer continued, but the resulting nervousness and gastro-intestinal disturbance was so annoying that I felt compelled to abandon the test. A very appreciable contraction of the visual fields and slight amblyopia was demonstrated before the conclusion of the test.

Dr. Reynolds speaks of congestion of the retinal veins and contraction of the arteries in the cases reported by him. I was not able to distinguish any features of this kind in either of my cases. The only variation in the appearance of the fundus noted was a slight pallor of the temporal half of the disc and faint haziness of the border of the disc. One of my confrères who made an ophthalmoscopic examination of my eyes during the height of the coffee toxæmia said that aside from a slight pallor of the temporal half of each disc there was a faint haziness over the entire retina of each eye, most pronounced at the margins of the discs. The haziness entirely disappeared following abandonment of the use of coffee.

THE USE OF PURE NITRIC ACID IN THE TREATMENT OF DISEASES OF THE EYE, ETC.

DR. J. W. BULLARD,

PAWNEE CITY, NEBRASKA.

I began the study of medicine in the office of my father who was an Eclectic, and in his library was a "Manual of

Eye Surgery," by A. J. Howe, A.M. M.D., Prof. of Surgery in the Eclectic Medical Institute of Cincinnati, Ohio. In the chapters on Pterygium, Keratitis and Ulceration of the Cornea, the author speaks of the use of pure nitric acid in the treatment of these affections. It was here that I first received my inspiration in the use of nitric acid in the treatment of certain diseases of the eye.

In the discussion of Dr. Kipp's paper at the Saratoga meeting of the American Medical Association, when Serpiginous Ulceration of the Cornea was under consideration, Dr. Edward Jackson spoke of using it in 20 to 50 per cent. solution; Prof. Haab, who was present, spoke of using it pure, and Dr. R. L. Randolph, who followed Prof. Haab, also mentioned the "pure acid," but whether he referred to both nitric and carbolic or only carbolic, I am unable to say. In a paper read by the author before the Gage Co., Nebraska, Medical Society and published in the Western Medical Review, on "Ulcers of the Cornea," its utility was incidentally mentioned. The author was present at the meeting of the Baltimore Medical and Surgical Society, in April 1902, when Dr. Theobald read a paper on the treatment of ulcers of the cornea with carbolic acid, and took part in the discussion, when he also advocated the use of pure nitric acid. Aside from these I do not know of any public mention having ever been made of the use of pure nitric acid in eye surgery.

Nitric acid is one of the most powerful escharotics in the mineral acid group, but as it coagulates the albumen of the tissues without redissolving it, it in this way safeguards its own excessive action. (Potter). It has always been recommended in phagedenic conditions in structures other than those of the eye. In eye surgery its action can be controlled to a nicety and in the great majority of cases is just as effectual as is the action of the actual cautery, possessing all the advantages of the latter and none of its disadvantages. You cannot, however, as is necessary in some serious cases of deep infected ulcers of the cornea with accompanying hypopyon, do a paracentesis with it as can be done with the cautery; neither can large masses of tissue be destroyed by it, but in the ordinary infected ulcers of the cornea, it will do all that the cautery will do, and with less inconvenience to both sur-

geon and patient. It is a very difficult matter to get some patients to be absolutely quiet while you are using the cautery, as they not only see the red hot electrode, but feel the heat. The acid is always handy, requires no apparatus, and does not fail you at the critical moment as is sometimes the case with the cautery. The action is deeper than that of carbolic acid, but not too much so if used with proper care. It possesses the advantage over iodine, that it forms a zone of coagulated tissue around the ulcer, thus closing the lymph spaces which produces a barrier against the further invasion of the healthy tissues by the ever-present microorganisms. In short, it may be used in any condition of the eye in which a cauterant is needed, as it is sure destruction to all forms of germs, thus checking the onward march of the spreading ulcerative process which is dependent on the action of microorganisms.

The mode of application is as follows: a small piece of pine, I usually use the non-combustible end of a match-stick, is whittled to a blunt, not a sharp point, and dipped into the acid and held till all moisture has disappeared. There will still remain enough of the acid for use. The eye, which has been previously cleansed and cocainized, is held open by the thumb and index finger of the left hand, and the ulcer either wiped dry with a probe wrapped with sterile cotton, or if there is much debris, curetted, when with the acid stick the floor and edges of the ulcer are touched. It is important that the ulcer be dry, or at least, comparatively so. The application coagulates the tissues with which it comes in contact, causing them to turn white, thus it is an easy matter to watch the extent of the cauterization. In phlyctenular conjunctivitis I almost invariably touch the individual phlyctenules with the acid stick, and with the happiest results; one application usually being all that is necessary to terminate the attack. This does not interfere with the constitutional and local treatment which is usually necessary to carry out to prevent recurrence.

In operating for pterygium it is not always possible to remove all the growth from the cornea. The essayist is usually in the habit of touching this residual portion with the acid pencil thereby hastening the absorption. It sometimes happens after a pterygium operation that there are some loops of

vessels thrown across onto the border of the cornea and the growth reforms. In this case, if the acid stick is drawn across the bundle of vessels, just before it reaches the cornea, and this process is repeated at intervals of four or five days, the blood supply is cut off and the growth disappears. In old vascular conditions of the cornea the vessels may be obliterated in the same way.

In cases of fascicular ulcer of the cornea, and in fact in every and all conditions of either cornea or conjunctiva where a cauterant is needed it is the ideal remedy.

For the past twenty years the author has used the acid almost exclusively, very rarely resorting to the cautery, and with such success that I thought it advisable to present the matter before this body. I feel sure if any of my confrères will use it as I have outlined, they, too, will be delighted with its action.

DISCUSSION.

DUDLEY S. REYNOLDS: I will call attention to the fact that the late Mr. Dixon of London, mentioned the use of fuming nitric acid in certain conditions, including granulated lids, which included trachoma and conjunctivitis. Mr. Dixon's plan was to shave off with a razor the hypertrophied papillæ, and apply the fuming nitric acid with a glass brush. In the Holmes' System of Surgery I think some mention of it will be found. I am sure Sir William Lawrence used dilute nitric acid in the treatment of purulent ophthalmia, mention of this practice may be frequently found in the literature of seventy-five years ago.

GEO. F. SUKER: In the application of the nitric acid, especially of the fuming variety, it is important not to touch the healthy cornea. It is a good policy to instill olive oil in the eye and then wipe off the area to be touched, thus avoiding injury to the healthy cornea.

J. A. DONOVAN: The doctor speaks of nitric acid as doing nearly all the electric cautery will do. Since reading a paper before this society a year ago, I have used the cautery something like a hundred times. I have in three instances been obliged to use it the second time. I never had to repeat it more than the third time in any case. I can use the electric

cautery in my office in less time than I could arrange this nitric acid, and feel safer. About the last fifty times, I used it at barely red heat. The black heat, just before the point of red, is safer, and as safe as anything possibly could be that is efficient, and it also eliminates the feeling of heat in the cornea. Another thing, the nitric acid touches the floor of the ulcer, already deeper than you want, and of necessity makes it deeper; the cautery is used only at the edge. I consider the electric cautery the best method we have for treating ulcers.

J. A. L. BRADFIELD: I am an enthusiast for pure nitric acid and have been for the past ten years, and I most radically differ from what has just been said. Corneal ulcers can be treated with the least possible loss of tissue with nitric acid. An application can be made to the diseased portion and limited to that. It seems that many do not understand the use of the acid. Some, in using nitric acid as suggested by Dr. Reynolds, will get into serious trouble. The nitric acid is so powerful that we must be absolutely certain of what we are going to do. I use a hard tooth-pick instead of a match. By making the point to correspond with what you want to touch I have no trouble in getting exactly the effect desired and no more. Never let it be used until dried in the atmosphere.

A. ALT: I would like to ask Dr. Bullard whether he would use the nitric acid also in beginning epithelial cancer on the conjunctival limbus.

W. L. DAYTON, Lincoln, Neb.: I believe if the stick with which the nitric acid is to be applied is properly prepared there is no danger as pointed out by Dr. Suker. Wait until the moisture has gone and then prepare the stick, which should be cut off squarely at the bottom and not rounded or pointed. Dr. Bullard undoubtedly believes thoroughly in the use of nitric acid, as he requested me to apply it when I operated for him a few years ago. Since then I have used it a number of times on indolent ulcers. Where for any reason you do not care to use the cautery, nitric acid is a very excellent substance.

DR. BULLARD (closing discussion): In answer to Dr. Suker, I will say that I have never had to take any precautions

against injuries from allowing the fumes of the acid to coming in contact with the cornea. Of course I allow the stick to become thoroughly dry before using it. I am glad to know that many of the members are using nitric acid. I am sorry that some of the literature on the subject has escaped me, tho I looked it up pretty thoroughly as far as I had time. Dr. Donovan speaks of destroying more tissue by touching the bottom of the ulcer. I have never had any scar except where the tissue had been destroyed to such a depth already that scar tissue was inevitable, and besides I prefer to run the risk of destroying a little more tissue rather than allow the destructive process to cause perforation of the cornea. In answer to Dr. Alt, who asks if I would use the acid in epitheliomata of the conjunctiva, while I have had no experience along this line yet I should not hesitate to do so, and I believe with good results. Dr. Dayton says I have the courage of my convictions. He operated on my right eye for pterygium, and I requested him to make the application on the cornea, and my pterygium, which was a bad one, has never troubled me since. I have been enthusiastic in the use of the acid. I cannot conceive the idea of getting sufficient heat in the electrode to cauterize the ulcer and the patient not feel the heat, if not on the cornea then on the lids. It may be that I have not used the cautery enough to be experienced, but I have been so thoroughly satisfied with the acid that I have not thought it necessary.

FURTHER EXPERIENCE AND TREATMENT OF KERATOCONUS.

J. A. L. BRADFELD, M. D.

LA CROSSE, WIS.

Keratoconus as a disease which has advanced till a well-formed cone is present, is very rare. If the atonic condition of the cornea which allows that membrane to lose its normal curvature irregularly, which is always the condition in the early development of the cone is called keratoconus, then keratoconus is a fairly frequent disease.

Observation convinces me the latter proposition is true. The most important aetiological factor is a fault in the general nutrition; secondary, eye strain (as over-use), bad light, unsteady position and errors of refraction. When the softened cornea gives way the resulting irregular astigmatism causes eye strain, which greatly hastens the progress of the disease.

The fault in the general system is often one which is self-correcting. Should this occur in the early stages of the disease we have only the slight ectasia as a mark of its existence. While if the cornea has proper attention at this stage no evidence whatever may remain. Should the disease continue until the area of affected cornea protrudes, a well-formed cone exists and a corresponding thinning of the apex takes place, only palliation is possible and good vision never restored.

Incipient keratoconus is always accompanied by failing vision and usually by asthenopia. When increasing myopic astigmatism is found with a variation of the axes with the principal meridians not at right angles, a positive diagnosis of keratoconus may be made.

Were the name kerato-atonía substituted for keratoconus the disease would much oftener be diagnosed at the stage where cure is possible.

TREATMENT.

Correction of any fault in the general system, rest of the eyes, correction of errors of refraction, before the ectasia has advanced until the cornea has become thinned, local application of the sulphate of alum to the diseased cornea. When a well-formed cone is present, cauterization of the apex of the cone with broad, low heated galvanic electrode, with subsequent iridectomy for visual purposes. Myotics and iridectomies as practised for glaucoma are valuable before the cone has advanced till it markedly protrudes.

To illustrate what may be done at the different stages of the disease, I report the following cases:

Case 1. Mrs. F., age 36, married, neurasthenic. Vision failing several years and eyes so irritable as to be unable to use them for a year. Two month ago left became very pain-

ful, congested and almost blind. Right eye sympathised to such an extent as to be unable to see to get about alone. Examination revealed well-developed cone on right eye and marked cone with ulceration of the apex in the left eye. Patient was put on tonics and nerve sedatives. Ulcerating apex of left thoroughly cauterized perforating the membrane. But little reaction and pain greatly lessened. Compress bandage kept on three weeks when wound was well healed and cone greatly reduced in size. Two months later made iridectomy in each eye, section reaching to the periphery, after which the eyes became quiet and revealing vision O. D. V 20/200; 20/120 W. + 3.00 \bigcirc — 8.00. ax. 75. O. S. V = Counting fingers ten feet, improved by minus lens. After a year she reports eyes feeling much better and able to do all ordinary house duties.

Case 2. Mr. C., aged 19, stenographer. Seen first June 23, 1901. Appearance of general health good but had been rachitic when younger. For last year eyes had been irritable and vision failing for distance. Ophthalmometer showed 1 $\frac{1}{2}$ D. ax. 55 or 150 in right eye and 1 D. ax. 45 with slight irregularity in left. O. D. V = 20/80 : 20/25 W — 1.50 \bigcirc — 1.50 ax. 50. S. V. = 20/60; 20/15 — W — 1.00 \bigcirc — .75 ax. 0.

Diagnosis.—Kerotoconus and advised glasses, change of work and treatment.

Aug. 18th, 1901, the following conditions present: O. D. V = 20/60; 26/25 W. — 50 \bigcirc — 100 ax. 90. O. S. V = 20/25; 20/80 — W. — 1.00 \bigcirc — .75 x 90 which was prescribed. Referred to family physician for general care and work changed to shipping clerk. Began treatment of cornea by local application of crystals of alum sulphate three times a week, which was continued till Feb. 8th, 1902, when ophthalmometry showed 1 $\frac{1}{2}$ D. ax. 60 in right, and 1 $\frac{1}{2}$ D. ax. 60 or 160 in left eye. O. D. V = 20/60; 20/25 W — 1.50 ax. 120. O. S. V. = 20/40; 20/25 W — 125 ax. 0, which correction was prescribed. Local treatment continued till July 5th, 1902, but less frequent, when ophthalmometry showed O. D. 2 $\frac{1}{2}$ D. ax. 45 and O. S. 1 $\frac{1}{4}$ ax. 135. O. D. V. = 20/60; 20/25 W. — 75 \bigcirc — 2.00 ax. 100. O. S. V; = 20/60; 20/20 W. — .75 accepting C. X. O. Dec. 7, 1902. Ophthalmometry O. D. 4 D ax. 140, O. S. 2 $\frac{1}{2}$ ax. 140 O. D. V =

20/120; 20/40 W. — S. \odot — 2.50 ax. .75. O. S. V = 20/25 AC + 50.

Alum again used quite regularly, also eserine in right eye till May 25th, 1903, when ophthalmometry showed O. D. 6 D, ax. 50 or 145, O. D. V = 20/00; 20/60 W. + 4.00 \odot 6.00 ax. 80. O. S. V = 20/25 AC + 1.00. Patient's work now called him from the city. Prescribed eserine in right eye and collyrium of four per cent. alum sulph. in each eye three times a day. May 29th, 1904, he returned with the following conditions: Slight cone of right cornea. O. D. V = 20/200; 20/80 W. — 8.00 \odot — 5.00 ax. 55. O. S. V = 20/25 AC + 1.50. For last few months the error of refraction has not been corrected in the right eye. He is doing a good deal of writing and bookkeeping and the eyes are very comfortable. I believe an iridectomy should have been made in the right eye when the myopia began to develop but was positively refused. Cauterization will probably be necessary in a few months.

Case 3. March 30, 1902, Mr. B., mail clerk, aged 35. Vision of right eye very poor and left irritable on use. Slight ciliary and conjunctival irritation. Ophthalmometry showed O. D. 1 D. ax. 90 or 165. O. S. 1 D. ax. 25 or 105. O. D. V = 20/60; 20/20 W. + 25 \odot — 1.50 ax. 0. O. S. V = 20/25; 20/20 W. + 25 \odot — .75 ax. 105, which was prescribed, and diagnosis of keratoconus made.

April 22, 1903, ophthalmometry showed O. D. V — 20/60; 20/20 W. + .75 \odot — 2.00 ax. 0. O. S. V = 20/20; 20/15 W. + .75 \odot — 100 x 125. Correction given and alum sulph. applications made twice a week till Aug. 14, 1903, when O. D. V = 20/60, 20/25 — W. + 1.25 \odot = 125 x 0. O. S. V = 20/15 — AC + 25. Eyes feeling well and works with perfect comfort. Aug., '04, refractions practically the same and eyes perfectly comfortable.

Case 4. Feb. 9, 1899, Mrs. D., consulted me for asthenopia; when found following conditions: External muscles and corneae normal, O. D. V = 20/25; 20/20 W. + 1.00 in each eye. Presbyopia + 1.75. Sept. '02, saw her again when vision and refraction were same but requiring + 2.50 D. for reading. During last few years had good deal of sickness in family and kept very tired all the time. April 1,

1904, called on me with following history: Lost husband a year ago and since very nervous. Last Jan. had grippe; eyes became congested, painful and vision poor. Was treated for conjunctivitis till consulting another doctor who recognised something more serious and sent her to me. I anticipated glaucoma but found tension normal, general health below par and excretion of urinary solids below normal. Marked ciliary and conjunctival irritation. Cornea soft and reflex very poor. Ophthalmometry showed O. D, $1\frac{1}{2}$ D. ax. against the rule and quite irregular O. D. V = 20/80 not imp. by g. O. S. V 20/80 not much improved by glasses. Diagnosis, keratoconus.

TREATMENT.

Diuretics followed by tonics; locally positive galvanism over palpebrum, and alum sulph. to cornea once a day.

April 26th, the conjunctival and ciliary congestion gone. Corneal curvature normal. O. D. V 20/40; 20/25 W. + .75. O. S. V 20/40; 20/25 W. + 1.00. Eyes quiet. Gave collyrium of four per cent. alum sulph.

Aug. 4th. Vision and refraction were same. The old asthenopia still remaining.

THE REAL PRINCIPLE OF TEST-TYPE CONSTRUCTION.

By B. ALEX. RANDALL, M. A., M. D., PH. D.,

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The principle of test-type construction was laid down by Snellen in 1862, that roman capital letters, whose height subtends at the chosen distance an angle of 5' and with lines and interspaces one-fifth of this height constitute a fair average test for visual acuity. These tests were based upon the

visual angle as defined by Scheiner in 1600. While, as shown by Booke in 1705, stars can be distinguished when some 30" apart, and wires or rods under an angle of about 50", (Helmholtz), the short member of the block-letter must have interspaces of 60" to be clearly defined. This affords a retinal image of some .004 mm., and perception of form prob-

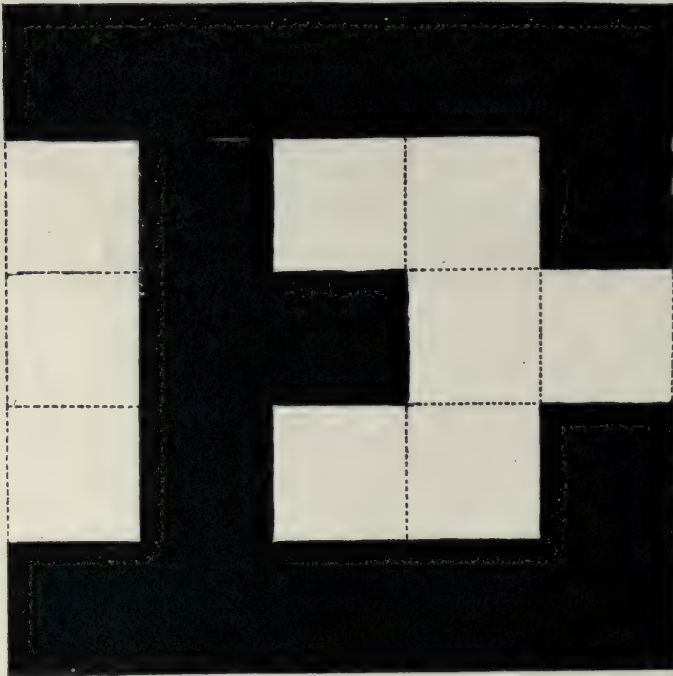


Fig. 1.

Green and Snellen's Test-Type.

ably depends upon excitation and nonexcitation of the adjacent cones of the macular region, with the size of which this closely corresponds. The sure recognition of an interspace seems to demand the presence of at least one unexcited cone between those affected. This standard, which holds fully for parallel lines or letters of like readiness of recognition, is fairly maintained as to strictly comparable figures, such as

the "haken" of Snellen; but it fails utterly when dots to the number of 5 or 6, separated by their own breadth, are to be distinguished. Experiment shows that the dots can be counted

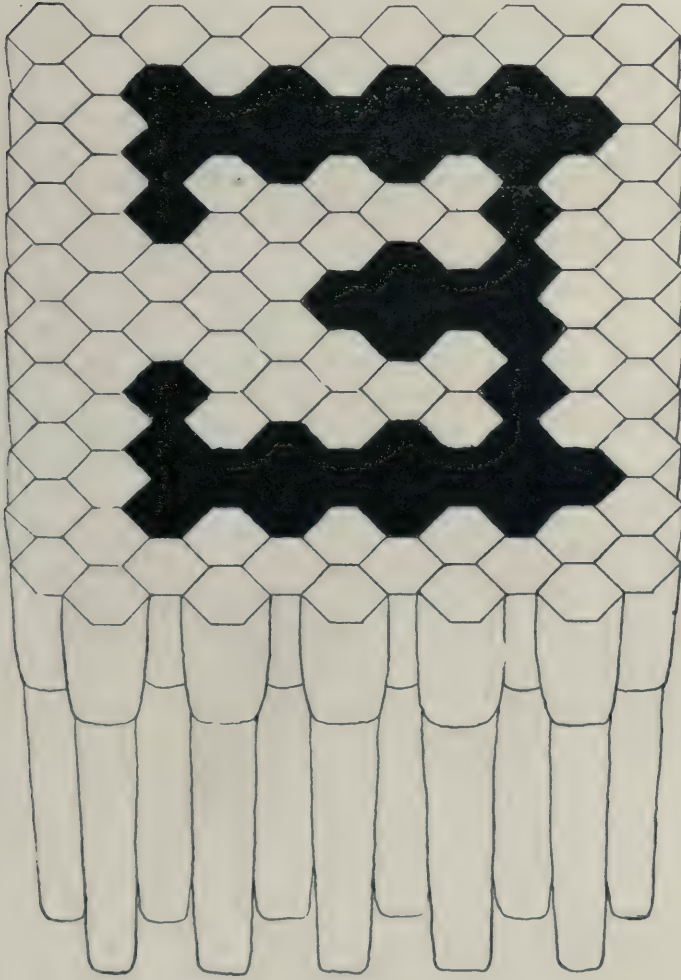


Fig. 2.
Retinal Image on the Macular Cones.

only when each subtends an angle of nearly $2\frac{1}{4}''$, as set forth by Burchardt in his "Internationale-Sehproben," 1868, and by others who found that Snellen's dots on the scale of

his type for 50 feet were just fairly seen at 20 feet. Snellen, therefore, abandoned the dots rather than amend his principle, which even in his letter writings he terms the "5' letter."

John Green improved the sequences of the distances for which he constructed letters, giving each the constant ratio of 0.795 to the next larger letters; but he used a simple Gothic letter with strokes subtending 1' but with interspaces often three times as great. (Trans. Amer. Ophth. Soc., 1868). Hence his letters were too easily read; and Wallace later reduced them to 4' height, making a fairer empirical card. Dennett used similar letters, but enlarged the difficult and diminished the easy from the 5' size, thus giving letters of equal legibility but of wholly empirical basis.

Green in his edition of Carter (1878) gave us a new letter—a block roman capital of more conventional and reasonable form than Snellen's, in which the expanded feet and other adnexa of the letters were generally formed of half-minute blocks. Employing this type, Snellen's principle can be strictly applied and most of the alphabet can be inscribed in a 5' square with 1' lines and interspaces. The I and J are much too easy, the M and W rather too hard to discern, while others with circular or oblique lines are either easier or harder than the average, yet constitute valuable confusion tests.

Pleased with the more perfect exemplification of Snellen's principle afforded by these letters and recognizing more fully than any writer had set forth that the real principle was that *interspaces*, rather than lines should subtend an angle of 1', I constructed in 1880 series of test-cards with Green's letter, and published such a card in 1885 and again in 1895. With Drs. Risley and Posey as a committee I prepared for the Public Education Association of Philadelphia a simple school card in 1902, economizing space by using but a single letter for the larger types. For nearly twenty-five years it has been so clear to me that the 1' test is in letters the real test for visual acuity, that I have read such a view into the writings of Snellen and others, where it has been vaguely, if at all stated; and it is only latterly that I have felt the need of reiterating and enforcing this view by finding so many to be caricaturing or disregarding it. It may be known to all; but it certainly is not duly observed by many who have pub-

lished tests. Letters, or rather objects otherwise constructed, can have undoubted value; but they must rest on more or less empirical basis, and if they are not block-letters they have no right to claim to fulfil Snellen's principle.

Let us construct our test-objects so that they shall furnish at the desired distances rational images averaging nearly the minimum visible as calculated from the size of the cones of the retinal macula; and use the principle of contrast which seems to demand one unaffected cone between two stimulated cones to insure clear recognition of all details of fairly complex objects, and we will be nearer to a true standard for measuring vision. The illumination under which the tests are to be viewed must also be standardised as by the use of artificial light of fair constancy; since with narrow pupils under open sky one should see nearly twice as sharply as on the same card in the consultation room. The white letters upon a black ground as used by Seggel, Gould and others, have certain advantages; but the more usual black letter can be as well used if printed upon a surface distinctly creamy and free from such irradiation,

Snellen's first "Optotypi" were claimed to be based on the arc of 5' at the required distances; but in his later papers (Norris and Oliver, Vol. II., p. 18) he makes the usual error of using the tangent of the angle. Thus the LX meter letter has a height of 87.25 mm. instead of 85.5 as when calculated on twice the tangent of half the angle and should be visible at 61.22 m. While this error is small, it is needless, and typifies countless other wilful misrepresentations of the principle embodied in the various "Snellen's Types", which have been published.

REMARKS CONCERNING SOME PARTS OF THE
TECHNIQUE OF MULES' OPERATION, THE
HANDLING OF THIERSCH GRAFTS,
AND ADVANCEMENT OF THE
RECTI MUSCLES.*

BY JOHN E. WEEKS, M.D.

NEW YORK.

1. In performing the operation commonly known as Mules' operation, in which a ball made of glass, gold, silver, or other substance, is placed within the sclera, it is the experience of nearly all operators that the union between the margins of the sclera has given away sooner or later and that the enclosed ball has escaped. In order to make the union between the scleral margins perfectly secure, the writer has employed a suture which passes through the sclera as indicated at *a* in the accompanying diagram (Fig. 1), and which,

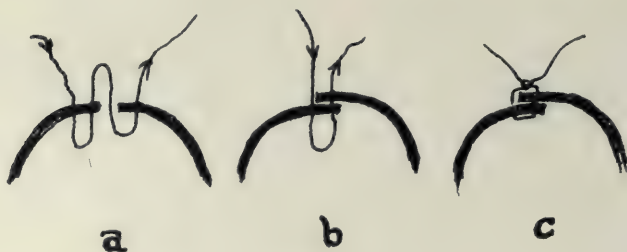


Fig. 1.

when tied, causes the margins of the sclera to overlap as at *b* and present the appearance as at *c*. Interrupted or continuous sutures may be employed. The writer uses chromotized catgut No. 1, which dissolves in from twelve to sixteen days. The union obtained is much more firm than can be obtained by end-to-end suturing. The conjunctiva is united over the sclera with silk sutures in the usual way.

2. The handling of Thiersch grafts in the ordinary way has undoubtedly given many operators not a little annoyance, because of the tendency to roll up and to become folded as soon as the flap is taken from the knife. The method employed by the writer has given him much satisfaction, as it enables him to handle the flaps and to adjust them to the surface to be covered with the greatest ease and certainty. The flap is cut from the selected surface with razor or special knife, flooding with normal salt solution in the ordinary manner. By the aid of the salt solution, the flap after it is detached is spread out as well as possible on the knife, the epithelial surface upward. A strip of sterile rubber tissue larger than the flap is now sparingly smeared on one side with sterile bichloride vaseline, 1-5000, and the smeared surface



Fig 2.

laid over the Thiersch flap and gently pressed upon it. The strip of rubber tissue, to which the flap adheres, is now lifted from the knife and the flap is spread out to its full extent. It is then cut while still on the rubber tissue to cover the area for which it is designed and applied to the raw surface, leaving the rubber tissue on the flap as a protective covering. The ordinary dressings are now applied. The rubber tissue may be removed after the lapse of four to six days.

3. In advancing a rectus muscle, the writer has found the following procedure to be satisfactory in technique and to give excellent results. Cocaine and adrenaline are employed whether a general anaesthetic is or is not used. With local anaesthesia the operation is devoid of pain of any moment. The instruments required are speculum, straight mouse-tooth forceps, medium size, fixation forceps, broad slotted forceps* (Fig. 2), strabismus hook, scissors (Stevens' strabismus

*These are strong fixation forceps with rather fine teeth. Each blade measures 6 mm. in width and is slotted. The slot runs from the edge of the blade upward 4 mm. and is 1.5 mm. wide to accommodate the closed blades of the mouse-tooth forceps. They are made by George Tiemann & Co., New York City.

scissors are very excellent), double-armed sutures of No. 3 or No. 5 silk, needle-holder.

At the beginning, the location of the horizontal meridian is marked in the conjunctiva at the margin of the cornea, corresponding to the side of the muscle to be advanced, by catching up the conjunctiva with the mouse-tooth forceps and nicking it with the scissors. This mark is of value as a guide in passing the central suture through the scleral tissue. The conjunctiva and subconjunctival tissue over the insertion of the tendon of the muscle to be advanced are now raised by means of the mouse-tooth forceps and are incised, the incision corresponding to the line of insertion of the tendon and extending a little beyond the insertion at either border. The tendon, now exposed, is seized at its middle with the mouse-tooth forceps and is snipped through. The detachment of the tendon is extended both ways from its center, leaving a stump of perhaps one-half millimeter attached to the globe, until an opening sufficiently large (six millimeters in length) to admit a blade of the slotted forceps is obtained. The mouse-tooth forceps are made to engage the middle of the tendon at its cut edge, the conjunctiva, and subconjunctival tissue, and these are held until the slotted forceps can be placed in position. One of the blades of the slotted forceps is slipped beneath the end of the tendon and the other blade is shut down on the engaged portion of the tendon, conjunctiva, and subconjunctival tissue, including one and a half to two millimeters of these tissues, the mouse-tooth forceps by which these tissues are held being accommodated in the slot. The mouse-tooth forceps are now removed, leaving the end of the tendon, conjunctiva, and subconjunctival tissue firmly engaged between the blades of the slotted forceps and thoroughly under the control of the operator. The detachment of the tendon is now completed.

Three double-armed silk sutures (No. 3 or No. 5) are employed, one of which, the middle one, may be white for purposes of identification. The needles that are passed through the tendon pass first from the under surface, including muscle, subconjunctival tissue, and conjunctiva. It is well known that the sutures, unless looped or tied over a few fibers of the tendon of the muscle, will pull through or cut

through the tendon to a greater or less degree, according to the tension, lessening the effect. The end of the suture that passes through the scleral and episcleral tissue does not cut through so easily. To prevent this cutting through and to avoid injury to the tendon by strangulation or cutting through a portion of the fibers, as may occur when a portion of the tendon is tied in the suture, the writer loops or "quilts" the middle suture in its passage through the tendon in all cases (see Fig. 3). In cases in which the traction is to be excessive, all three of the sutures are looped. This is done by

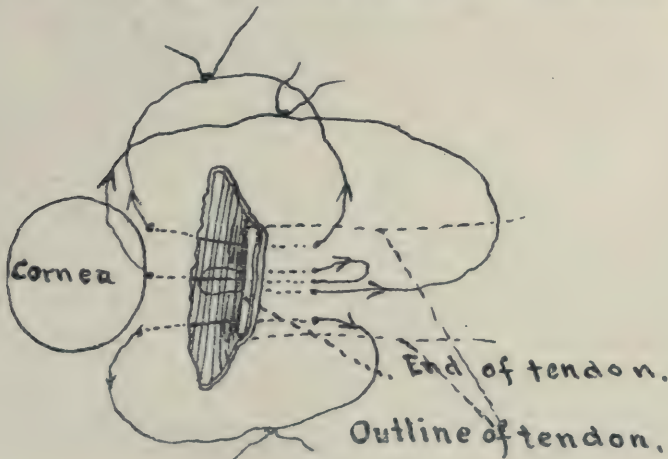


Fig. 3.

passing both of the needles of the middle suture through the tendon and superimposed tissues from the under surface, one millimeter on each side of the middle line of the tendon at the proper distance from the cut end of the tendon, and returning one of the needles through the middle line of the tendon from the conjunctival surface on the same plane with the first two. After the sutures are passed through the tendon, the desired shortening of the tendon is effected. The endeavor is made to include in the grasp of the slotted forceps only as much of the end of the tendon, conjunctiva, and subconjunctival tissue as it is desired to remove (one to two and a half millimeters). To effect the shortening, it is then necessary to cut away only what is grasped by the forceps. Care must be observed not to cut the sutures when excising the end of the tendon, and the sutures must pierce the tendon sufficiently far back from

the end of the tendon (four to six millimeters) to ensure a permanent hold. The sutures that engage the scleral tissue must now be passed. A short stump of the tendon, if left on the globe, will be found of much aid in affording counter-traction. The needle should pass beneath the conjunctiva, penetrate into the sclera, and include about one-half of the thickness of the sclera. The needle of the middle suture should emerge at the margin of the cornea exactly in the horizontal meridian of the cornea, and the lateral sutures should emerge tangent to this margin of the cornea five millimeters above and below the middle suture. The sutures are then firmly tied, drawing the end of the muscle toward the cornea as far as possible without cutting through tissue. The opposing muscle is or is not weakened, according to the judgment of the operator.

The sutures are removed after the expiration of eight or ten days. The writer sometimes bandages but one eye, but often bandages both eyes for from one to three days in order to prevent undue strain on the sutures by frequent movements of the eyes.

METALLIC FOREIGN BODIES WITHIN THE EYE AND THEIR REMOVAL, BEING A CLINICAL ACCOUNT OF TWENTY-SIX OPERATIONS OF THIS CHARACTER.

ILLUSTRATED.

By G. E. DE SCHWEINITZ, A.M., M.D.,

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IN recent years, especially since the utilization of the X-rays for the localization of foreign bodies within the eyeball, and the employment of large magnets, notably the Haab magnet, for their removal, this subject has assumed ever increasing interest. All surgeons are agreed as to the propriety of speedy removal of these bodies by means of magnets. There is still some difference of opinion whether

it is better to draw the imbedded particle of metal from its position around the lens into the anterior chamber by means of a powerful magnet, especially the Haab magnet, and then extract it through a corneal incision, or whether, having accurately localized it by means of the x-rays, it should be extracted through a scleral incision so placed that it shall be directly above the position indicated by the localization. In order to introduce a few remarks upon the subject, I append the condensed clinical histories of twenty-six cases in which the magnet has been employed, both with and without accurate localization for the removal of foreign bodies. They are as follows:

CASE 1.—James D., white, American, aged 28, was admitted to the Methodist Hospital on April 16, 1895, about one hour after he had received an injury of the left eyeball by a piece of steel which had broken from a chisel.

Condition of the Eye.—There was a cut 2 cm. in length along the line of the external rectus muscle; much vitreous had escaped and the eyeball was soft. The pupil was widely dilated, and only a dim view of the fundus was visible, the vitreous being obscured with blood-clot. V = counting fingers; visual field intact.

Method of Localization.—It was not possible to ascertain positively the presence of a foreign body by any of the usual methods then in vogue.

Operation.—The extension point of a Hirschberg magnet was introduced through the original wound and moved in all directions, without at first detecting a foreign body, and the eye dressed in the usual manner. Later, a small fragment of steel was detected just beyond the wound margin, where it had probably been drawn by the magnet and been rubbed off, when the instrument was withdrawn.

Result.—Healing was uneventful, and in two weeks the vision of the injured eye was 6/9. One month later hyalitis developed, and two weeks later detachment of the retina. The patient has not been seen since the last named date; but a second small fragment of steel was removed by another surgeon which was imbedded in the sclera. This case has been reported in the *AMERICAN JOURNAL OF OPHTHALMOLOGY*, Vol. XIII, 1896, p. 47. The small fragments of

steel found near the wound are not, however, recorded in this account.

CASE 2.—F. McD., aged 19 years, single, machinist, consulted me on January 13, 1897, on account of an injury to his left eye. Twenty-seven hours before his visit, while working around an engine and sledging upon some portion of the machinery, he was struck in the left eye with a chip of steel which flew from the piece of metal on which he was striking, the blow having been delivered in an upward direction. The foreign body entered through the sclera at the lower and inner quadrant of the eye. The patient was immediately taken to a neighboring hospital, where an electromagnet was twice introduced through the wound of entrance, without, however, removing the foreign body. The physician in charge of the operation stated that he thought he had moved the body, but that his magnet was not strong enough to withdraw it. The patient, by the advice of Dr. John Fay, then came to Philadelphia, with the hope of obtaining relief.

Condition of the Eye.—V. of L. E. = 5/60, with difficulty. The pupil was dilated widely, probably from the effects of atropin, the tension was diminished, the bulbar and tarsal conjunctivæ were flushed, and a small bead of vitreous protruded from a linear wound 3 mm. in length, situated 1/2 centimeter from the corneal border, downward and inward, between the insertion of the internal and inferior rectus.

Ophthalmoscopic examination was unsatisfactory, on account of the haze in the vitreous, which prevented accurate observation of the details of the fundus. As far as could be made out, however, these included a vertically oval disc, enormously distended and tortuous veins, a patch of white tissue upon the nasal side of the disc, a fringe of hæmorrhage downward and outward from the papilla, and far forward in the upper portion of the eyeground an indistinct spot of dark color, vaguely resembling blood-clot, but very difficult to study. The lower half of the vitreous was filled with large blood-clots, through which could be seen dimly the rent in the coats of the eye.

Method of Localization.—Prior to the magnet operation, before the patient came under my care and prior to my own

first operation, no method of localization other than that afforded by ophthalmoscopic examination was attempted. Before the third magnet operation was performed the foreign body was detected by the Roentgen rays and its position approximately determined. The X-ray examinations were made by Dr. Max J. Stern, of the Philadelphia Polyclinic, and indicated that the body was in the upper ciliary region.

Operations.—In the first magnet operation, the point of the instrument was introduced through the wound of entrance, and the result was negative. In the second operation the magnet was introduced through a wound in the upper ciliary region and was also unsuccessful. In the third operation the magnet was introduced through an incision, 8 mm. in length, in the upper ciliary region, midway between the insertion of the superior rectus and the corneal margin. The magnet used was according to the Hirschberg model, and the foreign body was immediately withdrawn. It weighed .0266 grams, or .41 grains, and was 4 mm. in length and 2 mm. in width.

Result.—The iridocyclitis, which was well established, rapidly subsided, and twelve days after the operation, the patient returned home with a vision of 6/12. There were some hyalitis and slight discoloration of the iris. Two months later vision was still 6/12, but the beginnings of proliferating retinitis and the formation of connective tissue bands were visible.

Remarks.—It seems to me a very interesting circumstance that an eye can sustain such great traumatisms and still heal with useful vision. These traumatisms consisted of those produced originally by the entrance of the foreign body and its lodgment in the ciliary body; those caused by the immediate introduction, twice, of an electro-magnet; those caused at my first-electro-magnet operation, when the points were introduced both through the wound of entrance and through a new opening; and, finally, those produced by the successful electro-magnet extraction through a cut in the same position. Furthermore, the foreign body was imbedded in the ciliary body for twelve days, and had already caused enough irritation to start a cyclitis. This case has been fully reported in the American Journal of the Medical Sciences, May, 1897.

CASE 3.—A. G., white, male, American, aged 18, while striking with a hammer on a steel drill, received an injury of the left eye, a piece of the metal penetrating the globe. He was referred to me by his physician, Dr. Alexander R. Craig, of Columbia, Pa.

Condition of the Eye.—The eye was examined within ten hours after the accident, and presented the following conditions: There was a small cut in the center of the cornea, about 4 mm. in length, from which was protruding a thin string of vitreous. A similar cut could be observed in the capsule of the lens, and the lens itself was entirely opaque. The iris was discolored. Vision equalled shadows.

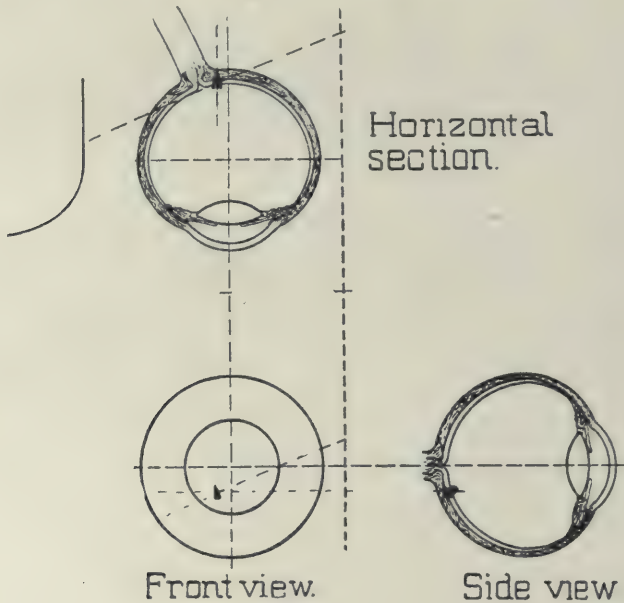


Fig. I.

Method of Localization.—The patient was referred to Dr. Sweet for X-ray examination, who reported as follows: The piece of metal, which is small and about 3 mm. long and 1 mm. wide, is situated 1 mm. above the horizontal plane of the globe, 1.5 mm. to the nasal side and 23 mm. back of the center of the cornea. This would bring it in the retina in the neighborhood of the macula. Fig. I.

Operation.—A scleral incision was made a little below the

lower margin of the external rectus downward and outward about a centimeter in length, and through this opening the broad, flat extension point of a Hirschberg magnet was introduced for 15 mm. The current was turned on, and on withdrawing the instrument, a triangular piece of steel was found attached to it, 2 mm. at its base, 1 1/2 mm. at its apex and 3 mm. in length. It weighed .0078 grams, or .12 grains.

Result.—The patient remained in the hospital one week, and was returned to his physician with the eye still slightly flushed, but in other respects in good condition. After his return home, he had an attack of pain with increased intra-ocular tension, which subsided under proper treatment and was evidently due to swelling of the crystalline lens. He was seen three months after the operation, his eye perfectly white and quiet, good light perception in all portions of the field and the ordinary appearance of traumatic cataract. The extraction of this would probably have restored vision, but the operation was declined.

CASE 4.—J. B., male, white, American, aged 40, while striking with a hammer on a spike received an injury of the left eye, and reported for treatment in the Jefferson College Hospital twenty-four hours later, having traveled a long distance on the railroad with a very imperfectly applied dressing.

Condition of the Eye.—There was a large cut in the sclera on the outer side, from which prolapsed vitreous and choroidal pigment were protruding. The eyeball was collapsed, the anterior chamber and, as far as could be ascertained, the vitreous filled with blood. Vision was doubtful light perception.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination January 5, 1901. The body is located at the equator and to the nasal side, that is, 12 mm. back of the center of the cornea and 12 mm. to the nasal side of the vertical plane. Fig. II.

Operation.—The broad extension point of a Hirschberg magnet was introduced through the original wound and immediately attracted to itself the piece of metal, which weighed .2284 grams, or 3.525 grains. The collapsed eyeball was

filled with physiological salt solution and the wound closed with interrupted sutures. The patient was placed in bed and the usual treatment of continued iced compresses, together with the internal administration of calomel, was instituted. There was no special reaction, and for a few days it appeared as if the wound might heal kindly. Indeed, it did close, but little by little the contracting exudates caused the eye to assume a quadrate form, and it never lost its tenderness and

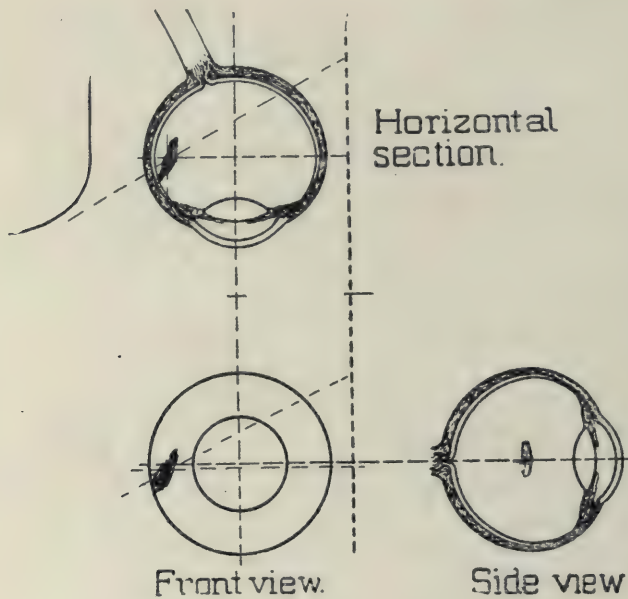


Fig. 2.

ciliary flush. Fearing that it might produce sympathetic trouble in the opposite eye, the shrinking globe was enucleated two months later.

Pathological Examination of the Enucleated Eye.—The eyeball was hardened in formalin and divided in the usual manner, half being mounted in glycerine-jelly and the other half submitted to microscopic examination. Fig. III. The eyeball is shrunk; the cornea shows new vessel formation and infiltration of the limbus. The iris presents evidence of

old iritis with destruction of the stroma cells, clumping of the pigment and fresh infiltration with mononuclear round cells, which are collected in round masses at the periphery and along the vessels. The vessels of the iris and ciliary body are hyperaemic and there is considerable extravasation of blood in the tissues, particularly in the meshes of the ciliary body and around Schlemm's canal. The lens shows advanced cataractous changes, especially in the posterior part, where the capsule is eroded. Behind there is a thick cyclitic mem-

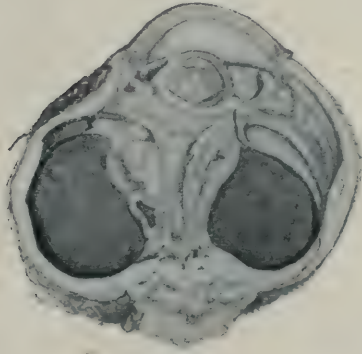


Fig. 3.

Gross appearance of the diseased eyeball, Case IV.

brane which extends across the eyeball, which is well organized and has produced detachment of the ciliary body and anterior part of the choroid. It contains considerable pigment from old intraocular haemorrhage. In it is imbedded the retina, which is totally detached, passing forward from the optic nerve. The retina is in an advanced stage of degeneration and contains between its folds old blood pigment. The choroid is hyperaemic, thickened in places by organized exudate, and shows moderate fresh cellular infiltration. Anteriorly it is detached by the cyclitic membrane. The ciliary body is atrophic and the meshes widely pulled apart by blood extravasations. . The optic nerve is also atrophic.

CASE 5.—J. C., male, white, American, aged 48, reported

at the Jefferson Medical College Hospital, with a chronic iridocyclitis and small corneal ulcer of the right eye. This eye had been injured eighteen years ago, but until a few weeks previously it had been quiescent.

Condition of the Eye.—There was well-marked chronic cyclitis, with occlusion of the pupil and cataract. In the lower part of the cornea there was a small ulcer. Vision was *nil*. The vision of the left eye was 20/XXX, and there was distinct sympathetic irritation.

Method of Localization.—Although there was no certainty that the eye contained a foreign body, the patient was referred to Dr. Sweet for skiagraphic examination, who reported as follow:

Examination January 28, 1900. Eye contains foreign body 1.5×1 mm. which is situated 8 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 1 mm. to the temple side.

Operation.—The extension point of a Hirschberg magnet was introduced through a scleral incision over the region in which the skiagram indicated that the body was situated, and it was immediately drawn to the lips of the wound. The condition of the eye was such, however, as well as that of the opposite eye, that an immediate enucleation was considered advisable, and it was performed. The signs of sympathetic irritation in the opposite eye subsided almost at once. The foreign body was 1.5 mm. long and 1 mm. thick.

Remarks.—This case furnishes a good example of the accuracy of Knapp's statement that foreign bodies may be tolerated for long periods of time in the eye, but can never be trusted, unless they are small and the accompanying changes trifling; otherwise they are liable to cause degenerative changes, and even after years cyclitis may arise and cause sympathetic disturbance in the fellow eye.

CASE 6.—H. D., male, white, American, aged 25, while striking with a chisel on some metal was struck in the left eye with a fragment, which penetrated through a wound in the inner corneoscleral area. He was immediately seen by Dr. Alexander Craig, who abscised the prolapsed iris, dressed the eye and sent him to me for further examination twenty-four hours later.

Condition of the Eye.—There was a ragged cut in the corneo-scleral region, at the inner side, the lens was cataractous and the anterior chamber half full of blood. Vision was reduced to hand movements above and to the outer side.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination March 29, 1900. Foreign body is situated 12 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 3 mm. to the nasal side of the vertical plane. Fig. IV.

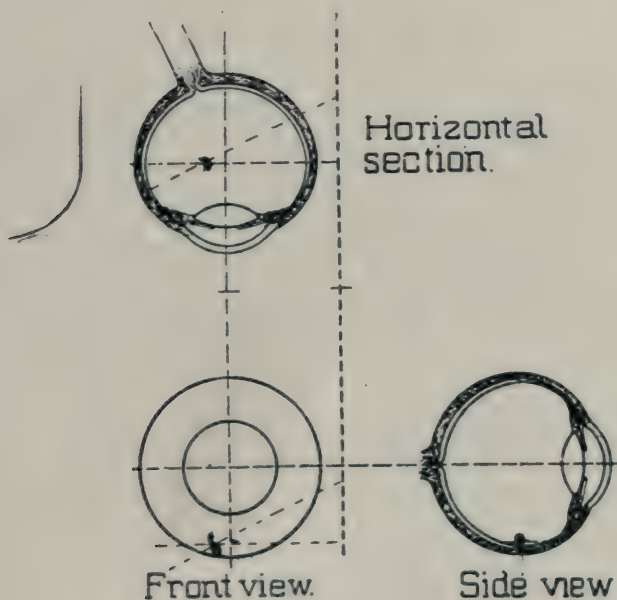


Fig. IV.

Operation.—The extension point of a Hirschberg magnet was introduced through a scleral incision placed according to the localization and the foreign body immediately withdrawn. The wound was closed with two stitches passing through the conjunctiva and sclera, and the usual treatment instituted. The healing was uninterruptedly normal, and the patient re-

turned to his home on the eighth day after operation. The foreign body weighed .127 grams, or 1.96 grains.

Remarks.—This patient was examined three years later. The eye had been perfectly quiet, and exhibited the appearance of a traumatic cataract and inward iridectomy. Vision equalled hand movements on the temporal side. Although a red reflex was visible through the partly absorbed lens, no details of the fundus were evident.

CASE 7.—H. K., male, white, American, aged 33, while striking with a hammer on some metal, received an injury of

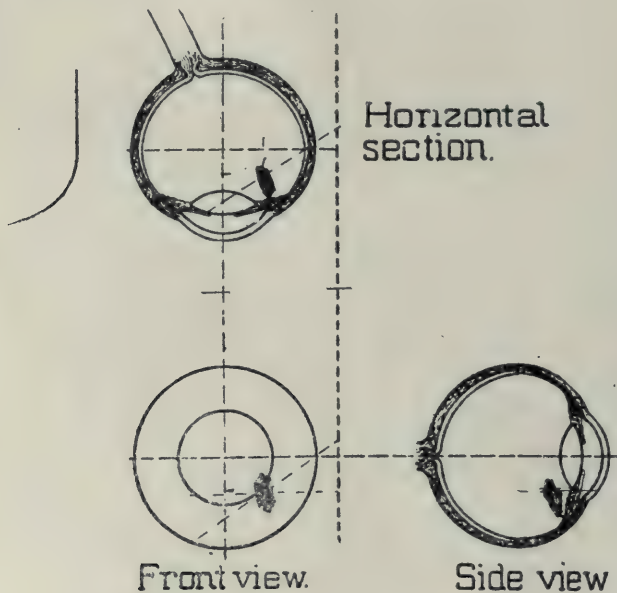


Fig. V.

the left eye, causing a wound of large size near the corneo-scleral junction. He reported twenty-four hours later at the Jefferson College hospital.

Condition of the Eye.—The iris was discolored, the eyeball collapsed, and the vitreous and anterior chamber filled with blood; T. — 2, V. doubtful light perception.

Method of Localization.—The patient was referred to

Dr. Sweet for skiagraphic examination, who reported as follows:

Examination October 21, 1900. The foreign body is situated 9 mm. back of the center of the cornea, 4 mm. below the horizontal plane, and 5 mm. to the temporal side of the vertical plane. (Fig. V.)

Operation.—The extension point of a Hirschberg magnet was introduced through the original wound and immediately a piece of steel withdrawn. The collapsed eyeball was filled with normal salt solution. The eye healed, but when the patient left the hospital, eight days later, it was still somewhat irritable, without view of the fundus. Two months later the evidence of contraction due to proliferating retinitis were present, the eye was painful, and it was enucleated. The piece of steel weighed 27 ctgs.

CASE 8.—J. W., male, white, American, aged 50, while striking with a sledgehammer on a piece of metal, was injured in the right eye. A few hours later an effort was made by the local surgeon to remove a foreign body, but this operation proved unsuccessful and he was referred to me for examination. He reported three days after the injury.

Condition of the Eye.—There was a complete ring abscess of the cornea, iritis and hypopyon, and deep in the angle of the anterior chamber, upward and outward, a small piece of metal could be seen.

Method of Localization.—As the foreign body was evident to inspection, no other method of localization was employed.

Operation.—The angle of the anterior chamber was opened with a keratome, a small piece of the iris excised, and the foreign body, deeply imbedded in the angle and ciliary region, removed. The anterior chamber was washed out with normal salt solution, and the usual treatment instituted. Unfortunately, the metal was lost and its weight cannot be given. Five days later the patient returned to the local surgeon, with the eye still much inflamed and the abscess of the cornea not yet resolved. Four months later he returned, and as the eye had shrunken and was useless, it was enucleated.

CASE 9.—T. McE., male, white, Irish, aged 33, while hammering upon some metal, was injured in the right eye, and reported for treatment about twenty-four hours later at the Jefferson College Hospital.

Condition of the Eye.—There was a large ragged wound through the cornea, the eye was filled with blood and vision reduced to light perception.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

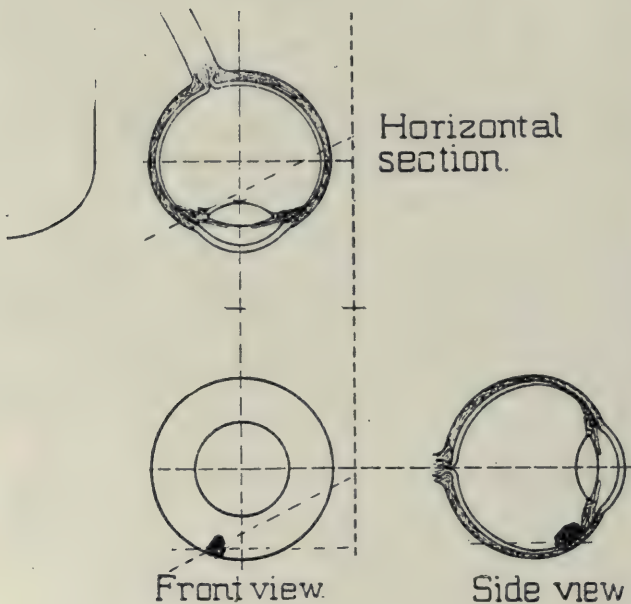


Fig. VI.

Examination April 5, 1901. The foreign body is situated 7 mm. back of the center of the cornea, 10 mm. below the horizontal plane, and 4 mm. to the nasal side of the vertical plane. (Fig. VI.)

Operation.—The extension point of a Hirschberg magnet was introduced through the original wound, and the foreign body immediately withdrawn. The usual treatment was in-

stituted, but in spite of it recurring intraocular haemorrhages with great pain continued. The patient became dissatisfied and left the hospital without permission and had his eye enucleated at another hospital. The weight of the foreign body was .1616 grams, or 2.495 grains.

Remarks.—It is very evident that this large foreign body had seriously injured some of the vessels of the choroid, perhaps the retina, and that the continued intraocular haemor-

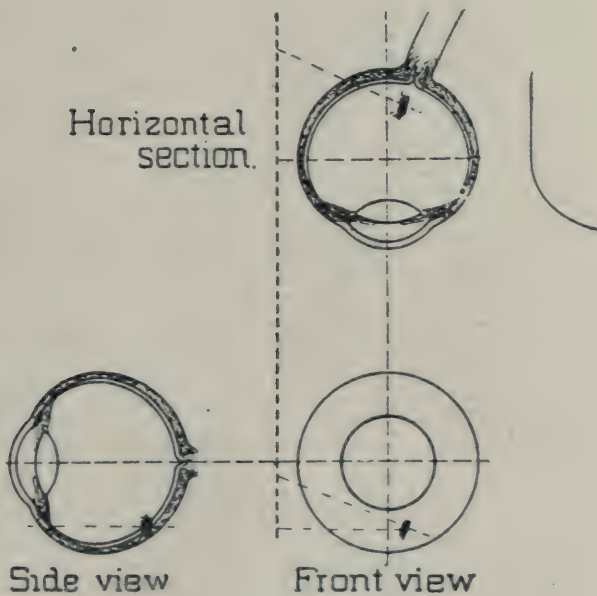


Fig. VII.

rhages were a consequence of this injury. Whether the eye would have quieted had the patient remained at the hospital is a matter of conjecture, but probably the original wound was sufficiently great, added to the intraocular haemorrhages, to have rendered, even had the patient remained under treatment, ultimate recovery hopeless.

CASE 10.—J. H., male, white. Irish, aged 38, while driving a steel pin, inserted in a clay mould, was struck in the right eye with a foreign substance. At the time of the ex-

amination it was uncertain whether this substance was steel or clay. He reported within twenty-four hours of the accident, and was admitted to the Jefferson College Hospital.

Condition of the Eye.—There was general bulbar injection and ciliary tenderness, together with a few spots of blood upon the iris. The lens was cataractous and swollen, and on its inner side there was a white spot more opaque than the rest, but close inspection failed to reveal any definite wound of entrance.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination May 16, 1901. The foreign body is situated 19 mm. back of the center of the cornea, 9 mm. below the horizontal plane, and 2 mm. to the nasal side of the vertical plane. (Fig. VII.)

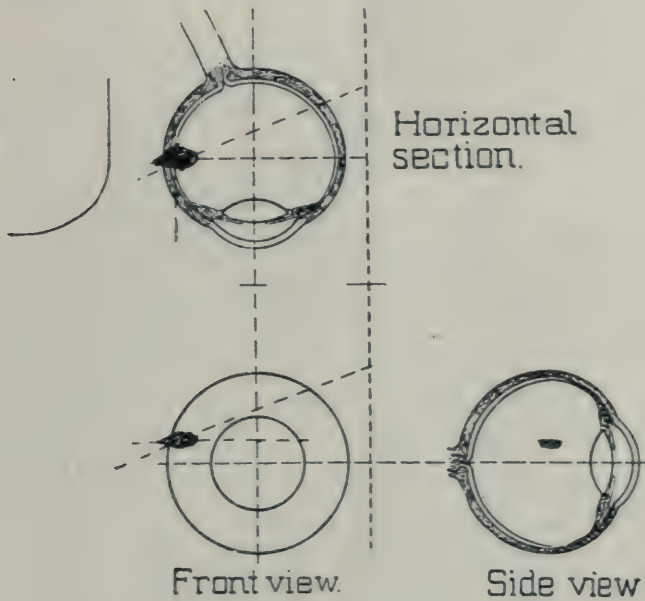
Operation.—The point of a Hirschberg magnet was introduced through a small scleral incision made in the region indicated by the localization as the position at which the foreign would be found, and this was immediately withdrawn and found to be a piece of steel weighing .0117 grams, or .18 grains. The patient was put to bed with the usual treatment and eight days later the swollen lens evacuated by linear extraction. Healing was uninterrupted, and six weeks later, with suitable glasses, $V. = 6/5$, the eyeground being normal.

CASE 11.—J. H., male, white, American, aged 35, while driving a spike, was injured in the left eye, producing a cut in the cornea-scleral region on the inner side, through which the iris was prolapsed. He was seen by a local surgeon, who excised the iris, but who seems not to have suspected the retained foreign body. One week later the patient reported at the Jefferson College Hospital.

Condition of the Eye.—There was well-marked iridocyclitis with discoloration of the iris, and the lens was cataractous. The inner half of the iris had been removed, as before stated.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination March 7, 1902. The size of the body is 6×4 mm. It is situated 3 mm. above the horizontal plane at



VIII.

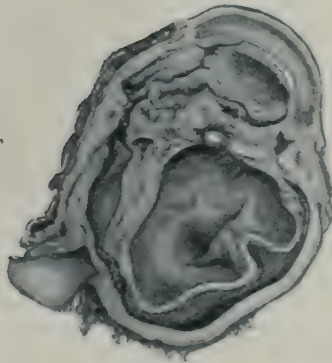


Fig. IX.

Gross appearance of the divided eyeball, Case 11.

the equator on the nasal side of the globe, one end probably cutting through the sclera. (Fig. VIII.)

Operation.—With a Hirschberg magnet, the point of which was introduced through a scleral wound at the inner side, a large piece of steel, which unfortunately has been lost and the weight of which is, therefore, unknown, was removed. The patient did extremely well for a time, but left

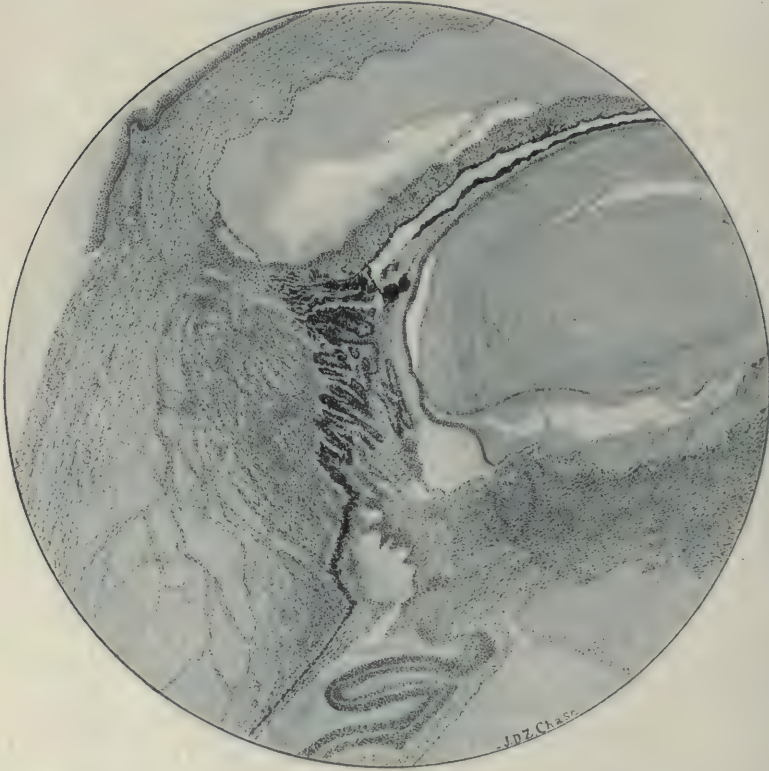


Fig. X.

Microscopic appearance of the divided eyeball, Case 11.

the hospital within a week after the operation against advice, exposed himself to a snow storm, and returned one month later with great increase of the iridocyclitis and beginning in-drawing of the scar of operation. Slight signs of sympathetic irritation in the opposite eye were evident and the injured organ was removed. The enucleated eye, after hardening in

formalin, was divided in equatorial section, and half submitted to microscopic examination and the other half mounted in glycerin-jelly. (Fig. IX.)

Pathological Examination of the Enucleated Eye.—The anterior chamber filled with exudate, and there is a wound evident just posterior to the ciliary region, with indrawn edges filled with scar-tissue. The cornea is distorted at this point and wrinkled, the retina is detached, the choroid shows haemorrhagic extravasations. Posterior to the lens there is a large mass of exudate. Microscopically the conditions are illustrated in the accompanying drawing. (Fig. X.)

The cornea is wrinkled and filled with cells, the iris infiltrated with cells, the ciliary body detached, and like the iris, shows an infiltration of large numbers of round cells, chiefly mononuclear in form and distributed in places in dense masses and in other places along the vessels. A mass of organized exudate exist behind the lens, into which the ciliary processes are drawn, with proliferation of their lining cells. The lens is cataractous and partly absorbed. The choroidal vessels are widely distended and filled with blood, which contain many polymorphonuclear cells. The vessels are surrounded by round cells. The retina is detached, there is a subretinal exudate, and in the retina are numerous round cells and some perivasculitis, while the retinal vessels contain polymorphonuclear cells. The retinal tissue itself is degenerated and oedematous.

Remarks.—From the pathological appearances just described it will be seen that they represent those which are typically concerned in the production of the so-called sympathetic inflammation, and indicate the fact that late extraction of the foreign body, after cyclitis is established, may often be unsuccessful to prevent the lesions which may eventuate in sympathetic disease, and illustrate forcibly the importance of early extraction of these foreign bodies.

CASE 12.—T. J. F., male, white, American, aged 35, while working with a lathe was struck in the left eye, and presented himself within two hours after the accident at the Jefferson College Hospital.

Condition of the Eye.—There was a small cut at the in-

ner ciliary region, and the anterior chamber and the vitreous so streaked with blood that ophthalmoscopic examination was impossible. Vision was reduced to counting fingers.

Method of Localization.—The patient was referred to Dr. Sweet for localization of the foreign body with the X-rays, but as the skiagram showed the presence of the foreign body, and as the case was entirely fresh, it did not seem worth while to wait for the exact plotting of the position of the body, and the eye was immediately submitted to operation.

Operation.—The original scleral incision was slightly enlarged, and with a Hirschberg magnet a small foreign body immediately withdrawn. This unfortunately has been lost and its weight cannot be given. Healing was prompt and uninterrupted, and after the absorption of the vitreous clots, aided by the administration of iodide of sodium and hot compresses, vision, after the correction of an existing myopia, was 6/6.

Remarks.—This is an excellent example of the importance of seeing patients with retained foreign bodies before infection of the wound or secondary inflammation of surrounding structures take place, and before the body has remained long enough to become surrounded by exudate. At the present time it would be impossible to tell that this patient has ever had an operation performed upon his eye for the removal of a foreign body.

CASE 13.—A. M., male, white, Italian, aged 30, five weeks before reporting for examination, while working with some metal, was struck in the right eye. Two days later he was examined by a local surgeon, who was unable to detect the presence of a foreign body, and who treated the eye expectantly.

Condition of the Eye.—Without dilatation of the pupil a few spots of opacity were found in the lens, and down and out in the retina a large haemorrhage in the neighborhood of the point of entrance of the foreign body, which existed as a wound downward and outward in the sclera. Elsewhere the retina was detached and the vitreous filled with floating opacities. The left eye was normal in all

respects. The patient was admitted to the University Hospital for treatment.

Method of Localization.—The patient was referred to Dr. Sweet for localization, who reported as follows:

Examination September 1, 1902. The foreign body is situated 15 mm. back of the center of the cornea, 4 mm. below the horizontal plane, and 6 mm. to the temporal side of the vertical plane. Fig. XI.

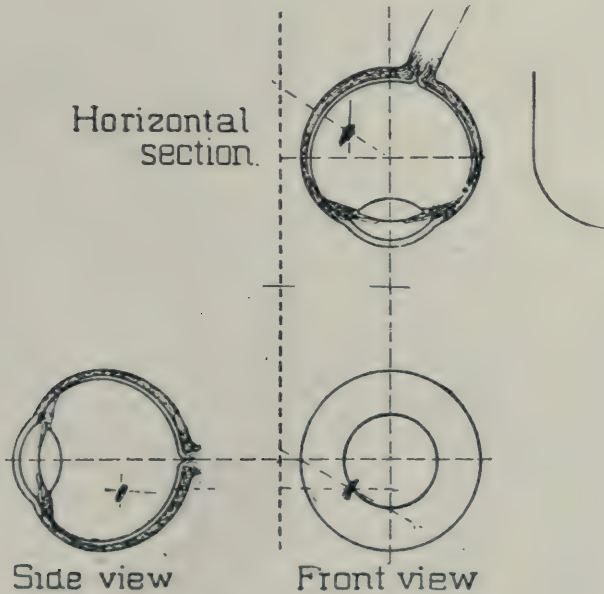


Fig. XI.

Operation.—A small incision was made with a Graefe cataract knife, about the width of the blade, over the region which the skiagram indicated as the probable position of the foreign body. The point of the magnet was not introduced within the wound, but only placed at its lips. Immediately the foreign body became attached to the magnet point. It weighed .0836 grams, or 1.29 grains. The patient was put to bed and the usual treatment instituted, healing being uninterrupted. At the end of two weeks the eye was white and

quiet, the retinal detachment unchanged, a slight increase in the lenticular opacity, and vision amounting to counting fingers excentrically.

CASE 14.—W. B., male, white, American, aged 20, while using a chisel, was struck with a flying bit of metal in the right eye, two months prior to his appearance for treatment. He was examined at the time, but a foreign body either not suspected or not found.

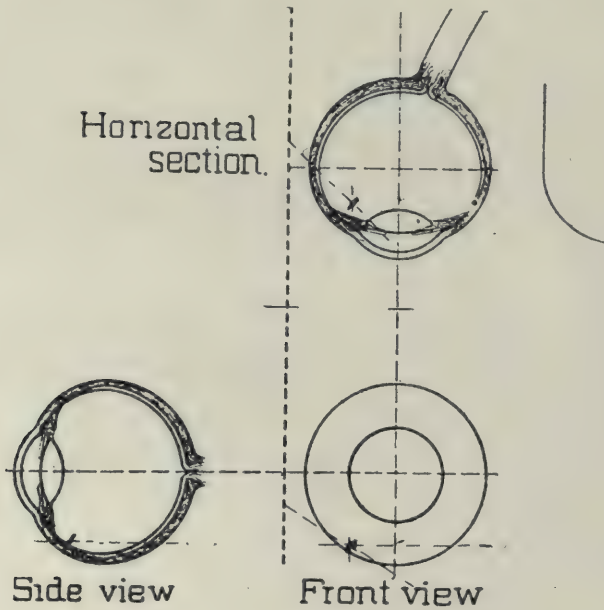


Fig. XII.

Condition of the Eye.—The iris was slightly discolored, there was a small scar representing the cut in the cornea upward and inward, and the lens was opaque. Vision equalled light perception, good in all proportions of the field.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination September 6, 1902. The foreign body is thin $2 \times 1\frac{1}{2}$ mm. It is situated 8 mm. back of the center of

the cornea, 9 mm. below the horizontal plane, and 6 mm. to the nasal side. Fig. XII.

Operation.—The body was removed through a small incision in the sclera, placed according to the localization, with a Sweet's magnet, which was approached to the lips of the wound but not introduced. The body weighed .0058 grams, or .09 grains. Three months later the cataract was extracted in the usual manner, without iridectomy. Healing was normal, and, with a suitable cataract glass, vision was $6/5$.

CASE 15.—T. S., male, white, American, aged 25, reported at the University Hospital with the statement that six months before he had received an injury while working at his trade, that of a foundryman, but whether a foreign body had penetrated his eye or not he could not say.

Condition of the Eye.—Vision amounted to $6/60$. There was a good deal of haze in the retina, and in the outer part below the macular region a mass of yellowish-white exudate containing a small black speck near its center could be seen, which probably represented a foreign body, and which undoubtedly was demonstrated to be a metallic body, because the point of a Sweet magnet applied to the sclera over the region named at once caused a sharp pain and the eye became attached to the magnet.

Method of Localization.—In addition to the demonstration just recited, as a matter of interest he was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination October 2, 1902. The size of the body is $2 \times \frac{1}{2} \times \frac{1}{2}$ mm. It is situated 13 mm. back of the center of cornea, 10 mm. below the horizontal plane, and 5 mm. to the temporalside of the vertical plane. Fig. XIII.

Operation.—A small incision was made in the usual manner through the sclera, between the insertion of the inferior and external rectus and the point of the magnet applied, without, however, securing the foreign body. The point of the magnet was then introduced within the vitreous cavity three times, but unsuccessfully in so far as bringing to light the foreign body was concerned. The eye healed uninterruptedly and although there was a well marked retino-chor-

oiditis for some time, this gradually subsided and vision equal to that at his original visit and somewhat better is maintained at the present time. Numerous skiagraphic examinations made since have failed to reveal the slightest trace of foreign body, nor has any examination with the magnet indicated its presence. It may, therefore, be assumed that the body

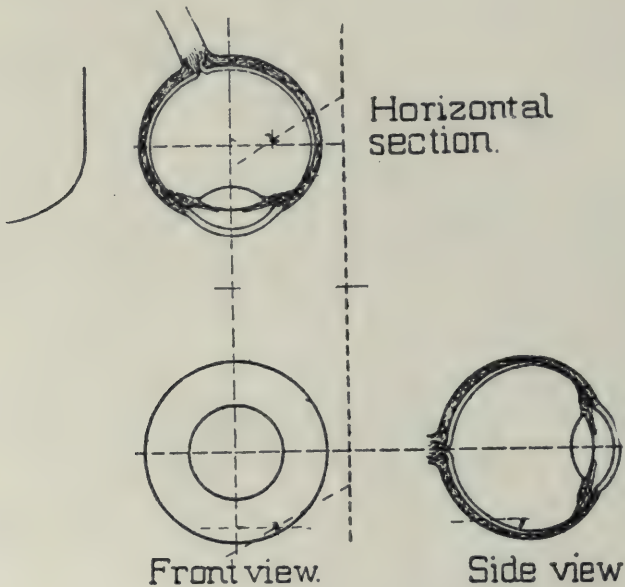


Fig. XIII.

was very small and in some manner escaped detection during the operation.

CASE 16.—J. B., male, white, American, aged 48, while working in a blacksmith shop, received an injury in the right eye, and submitted his eye to domestic medication, poultices and the like, reporting at the University Hospital two days after the injury, sent there by Dr. Craig, of Columbia.

Condition of the Eye.—There was a cut through the center of the cornea, the lens was opaque, the iris discolored, and there was a good-sized hypopyon at the bottom of the chamber.

Method of Localization.—The patient was not submitted to any method of localization, as it was determined to try and draw the body into the anterior chamber, should it exist in the eye.

Operation.—The point of a Sweet magnet was placed directly opposite the cornea, the current turned on, and almost immediately the foreign body appeared in the anterior chamber and was removed through the original corneal wound, slightly enlarged for that purpose. It weighed .0065 grams, or .1 grain. The chamber was washed out with physiological salt solution, and on two occasions packed with iodoform rods. At the second dressing the remains of the opaque crystalline lens were removed through the corneal incision and the rods again introduced. Healing took place slowly, and the iodoform treatment was successful in checking the spread of the infection, and the ultimate result was a sightless globe, with slight anterior phthisis, but to the patient this was a far more satisfactory result than an enucleation.

CASE 17.—W. D. G., male, white, American, aged 19, reported for examination at the University Hospital with traumatic cataract of the left eye.

Condition of the Eye.—The eye presented the ordinary appearances of traumatic cataract, with perfectly mobile iris and absence of ciliary irritation; light projection good in all portions of the field.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported that there was a minute foreign body 5 mm. back of center of cornea, 3 mm. below the horizontal plane, and 1.5 mm. to temporal side of vertical plane, that is, in the lens. Fig. XIV.

Operation.—The lens was removed by the ordinary method, without iridectomy, and the point of the magnet applied to the lips of the cataract wound. The presence of the body on the end of its extension point after the current had been turned on was not demonstrated. Healing was uninterrupted, and a suitable cataract glass gave the patient a vision of 6/6.

CASE 18.—J. J., male, white, American, aged 27, was injured with a small piece of flying metal in the right eye,

and presented himself about thirty-six hours later at the University hospital.

Condition of the Eye.—The eyeball was already infected, the ragged corneal wound being infiltrated, while purulent material was seen at the anterior chamber and the iris inflamed and thickened.

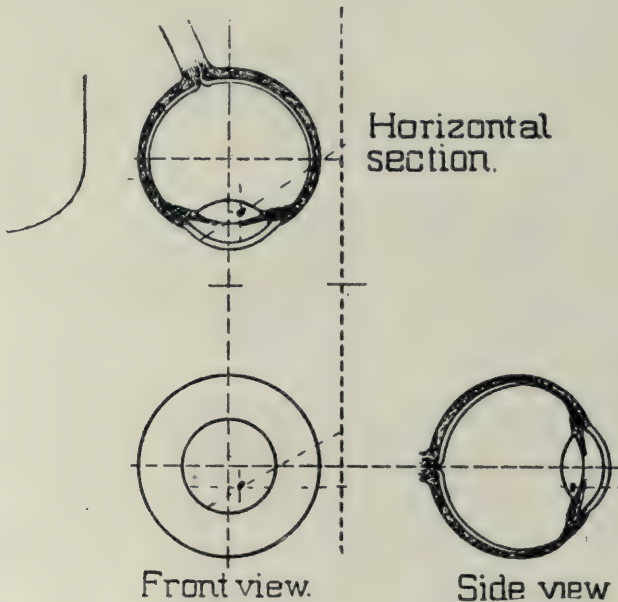


Fig. XIV.

Method of Localization.—The X-rays were not used to localize the body, but its presence was immediately detected with the magnet.

Operation.—With the Sweet magnet the foreign body was drawn into the anterior chamber and removed through the original wound. The chamber was washed out with normal salt solution and packed with iodoform rods. These, however, failed to check the extension of the suppuration, and after forty-eight hours of treatment, panophthalmitis being very evident, evisceration was performed. The foreign body unfortunately was lost and its weight cannot be given.

CASE 19.—J. S., male, white, Irish, aged 36, several months prior to his application for treatment, was spiking ties on a railroad and was struck with something in the right eye. He did not at the time know whether the fragment which struck him was a particle of metal or a bit of stone.

Condition of the Eye.—The eye presented the typical appearance of siderosis bulbi, the iris being of a rust-brown

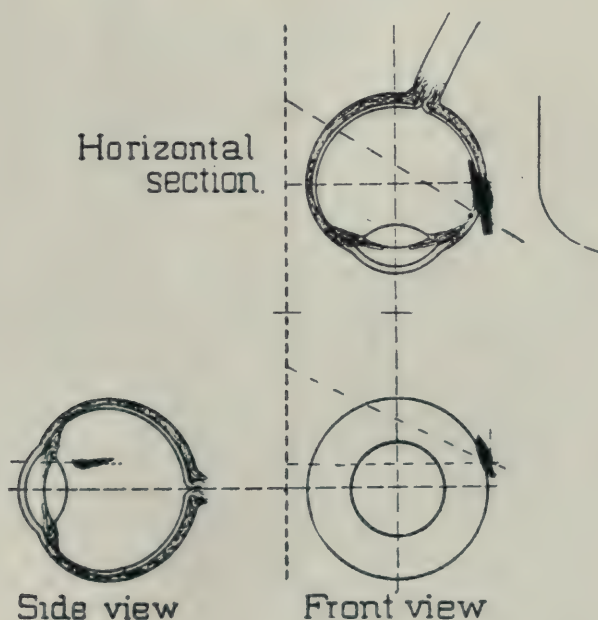


Fig. XV.

color, the lens cataractous and the vision faint light perception.

Method of Localization.—The patient was referred to Dr. Sweet for skiagraphic examination, who reported as follows:

Examination March 26, 1903. There is a foreign body 1.5 mm. \times 4 mm. situated above the internal rectus tendon, partly in the sclera. Fig. XV.

Operation.—The conjunctiva was incised just above the insertion of the internal rectus muscle and the point of a

Sweet magnet applied to the incision. Almost at once there was drawn to the surface the end of what appeared to be a large piece of metal. It was, however, so tightly imbedded in the scleral tissue and partly within the eyeball itself that it was necessary before it could be extracted to make a small incision along its side through the sclera, when it was at once removed from its surroundings and proved to be a piece of metal $1\frac{1}{2}$ cm. in length and 4 mm. in width, pointed at one end like an arrow. Its weight was .0982 grams, or 1.515 grains. The patient made an uninterrupted recovery, and left the hospital in forty-eight hours.

CASE 20.—W. Z., male, white, American, aged 61, presented himself at the University Hospital with the history that about twenty-four hours previously, while hammering on a nail, he was struck in the left eye with what was supposed to be a piece of metal.

Condition of the Eye.—There was a cut in the center of the cornea, slightly ragged and diagonal, the anterior chamber partly filled with blood and the lens already becoming cataractous. Vision was light perception.

Method of Localization.—The X-rays were not employed for the purpose of localization, but the body was detected by means of the magnet.

Operation.—The point of a Sweet magnet was applied to the center of the cornea, and almost immediately the foreign body appeared between the edge of the iris and the surface of the lens, and was drawn into the anterior chamber and extracted without difficulty through the wound. Immediately following the extraction there was a sharp haemorrhage, filling the anterior chamber and evidently filling also the vitreous, as the tension of the eyeball rose rapidly and the pain became intense. Under the use of hot compression and hypodermics of morphia this pain gradually subsided, and although on two occasions there was renewal of the haemorrhage, associated with marked chemosis of the bulbar conjunctiva, there was no suppuration, and gradually the reaction subsided and the eyeball became quiet with the ordinary appearances of phthisis bulbi. The foreign body weighed .0065 grams, or .1 grains.

CASE 21.—J. Jeffries, male, white, American, aged 15, while working in a cooper's shop and hammering upon an iron hoop, sustained an injury of the left eye, and presented himself within the first twenty-four hours at the University Hospital.

Condition of the Eye.—There was a small cut in the center of the cornea and the lens swollen and cataractous. Vision was light perception.

Method of Localization.—The patient was not submitted to X-ray examination, but the body diagnosed by means of the magnet.

Operation.—In the usual manner with the Sweet magnet the body was drawn into the anterior chamber, and came from a position just posterior to the lens in the anterior layers of the vitreous, and was removed through the original wound in the cornea from the anterior chamber. The patient made an uninterrupted recovery, and there was a natural absorption of the traumatic cataract, very much as after a dissection, with a vision of 6/15. The foreign body weighed 0.0162 grams, or 0.25 grains.

CASE 22.—A. F., male, white, American, aged 48, while cutting stone with a steel chisel, was injured in the right eye, the foreign body penetrating through the cornea and passing apparently into the upper ciliary region. He was referred to the University Hospital by Dr. Schum, and reported about 48 hours after the injury.

Condition of the Eye.—There was general bulbar injection, a wound in the upper corneo-scleral region and a cataractous lens. A slight ciliary flush indicated the beginning of iritis.

Method of Localization.—The patient was referred to Dr. Pancoast of the University Hospital for X-ray examination, who reported that the foreign body was situated posterior to the lens in the upper ciliary region.

Operation.—A small incision in the sclera over the region indicated by the localization was made and to it was applied the tip of a Sweet magnet. Immediately the foreign body was withdrawn, which measured 2 1/2 mm. in length. 1 1/2 mm. in width and weighed .0246 grams, or .38 grains. The healing was uninterrupted, and the patient returned to

his physician with a useful eye, the lens of which, however, was cataractous, vision being light perception in all portions of the field.

CASE 23.—F. C., male, white, French, aged 31, while working in a machine shop, was injured by a piece of flying metal striking him in the left eye, and presented himself within twelve hours after the accident at the University Hospital. An irregular cut in the center of the cornea, traumatic cataract, and hæmorrhage into the anterior chamber were evident.

Method of Localization.—The eye was not submitted to X-ray examination, but the body was localized by means of the magnet.

Operation.—The operation was performed by Dr. Mellor, who, by means of a Sweet magnet, drew the body, which had been situated, apparently, at a position posterior to the lens, into the anterior chamber and extracted it through the original wound. There was for some time afterwards a sharp traumatic iritis, which gradually subsided, and at the present time the eye is perfectly white and quiet, with good light perception in all portions of the field.

CASE 24.—J. D., male, white, Irish, aged 22, came to the University Hospital with the history that two days previously, while working in a cellar where there were some old boxes, he had been injured with a bit of metal which flew either from the head of the hammer, or from some of the iron bands upon which he was striking.

Condition of the Eye.—The eye showed well-marked beginning panophthalmitis, the conjunctiva being chemotic, the cornea containing a ring-like infiltration. the iris thickened and purulent.

Method of Localization.—The eye was not submitted to X-ray examination as it was hopelessly infected, but immediately examined with the magnet.

Operation.—After the foreign body had been drawn into the anterior chamber and extracted, the eyeball was eviscerated and the vitreous found thickly infiltrated with purulent material. Examination of this purulent material showed in addition to a streptococcus infection a marked growth of

the bacillus subtilis. The body weighed .023 grams, or .355 grains.

CASE 25.—A. H., male, white, American, aged 18, while working in a machine shop, was struck in the right eye with a bit of flying metal, and presented himself within twelve hours at the University Hospital.

Condition of the Eye.—There was a small cut near the corneo-scleral margin and the foreign body seen in the anterior chamber in contact with the iris.

Method of Localization.—No method of localization was required as the body was visible. The operation was performed by Dr. Mellor, who after making a small incision after the manner of that which is utilized in the performance of iridectomy, extracted the body with a small hand magnet. Healing was uninterrupted and the vision normal when the eye had become quiet,

CASE 26.—John G., male, white, American, aged 19, while working in a wire factory three weeks prior to his examination, was struck with a bit of metal which flew either from the hammer he was using or from the wire upon which he was striking.

Condition of the Eye.—The closest inspection failed to reveal any point of entrance of the foreign body, indeed, it was believed that there was no foreign body present. The iris was mobile, the eye in good condition and the vision 6 5. Examination with the dilated pupil showed in the upper and inner portion of the eyeground, 3 disc's diameter from the edge of the papilla above the macular region, a metallic body suspended by two delicate, thread-like strings from a circular white exudate. The exudate was surrounded by an area of choroiditis. The foreign body suspended thus in the vitreous could easily be seen with + 8 D. The appearances are depicted in the accompanying water color. (Fig. XVI.)

Method of Localization.—The method of localization was by direct inspection with the ophthalmoscope in the manner already described.

Operation.—The foreign body was readily removed through a small incision in the sclera placed slightly posterior to the ciliary body and midway between the internal and superior rectus, the point of a Sweet magnet being applied to the lips

of the wound, but not inserted into the vitreous. The body weighed .02 grains.

General Remarks.—Coming to a more intimate analysis of the material reported, we observe that in the 26 cases the right eye was injured 14 times and the left eye 12 times. The situation of these foreign bodies in general terms may be stated to have been as follows:

In the anterior chamber	-	-	1
In the lens	-	-	1
In the ciliary region	-	-	6
At or near the equator	-	-	9
In the posterior part of the eye	-	-	9

The ultimate visual result in these cases was as follows:

6/60, 1; 6/15, 2; 6/9, 1; 6/6, 6; counting fingers, 1; light perception with preservation of shape of eyeball, 5; phthisis bulbi, 2; enucleation or evisceration, 8.

Referring to the successes, that is, to those patients who after the operation had a vision of 6/60 or better, we find that the body was situated in the anterior chamber once, in the lens once, in the ciliary region three times, near the equator once, and in the posterior portion of the eye four times. One of the cases, which originally had a vision of 6/15, was seen later, about two months after the operation, and hyalitis had supervened and retinal detachment occurred. The patients who retained the normal configuration of the ball with a vision, either of light perception or counting fingers, could probably in all instances have had their visual acuity improved by extraction of a cataractous lens, but in no instance was this operation performed, and in some cases although advised it was not permitted. Of the two cases of phthisis bulbi, one was caused by successive intraocular haemorrhages, and the other came to the hospital with an infected cornea and iris, and the eyeball was saved after the extraction of the foreign body by Haab's method of placing iodoform rods within the anterior chamber, a method, however, which failed in another similar but more infected case.

Enucleation or evisceration was necessary in eight of the cases, either as an immediate procedure, or sometime after the removal of the body, in order to relieve the pain of an irritable stump, or to prevent sympathetic irritation. In all

of these cases the patients came under observation either after the body had been long situated within the ocular coats, in one instance for eighteen years, or when marked iridocyclitis or infection of the eyeball was already apparent.

Reverting to the length of time the body had existed in the eye before it was removed with the magnet, we have the following results:

Two hours, 1; three hours, 1; twelve hours, 1; one day, 7; two days, 6; three days, 1; seven days, 1; twelve days, 1; three weeks, 1; five weeks, 1; two months, 1; six months, 2; eight months, 1; eighteen years, 1.

It need hardly be pointed out that the length of time quoted is only approximately correct, for example, some of the cases which are noted as having come for treatment at the end of twenty-four hours may have come twenty-two or twenty-three hours exactly after the accident. It is often very difficult to ascertain from patients minute details of this character.

Counting as successful all those cases in which the eyeball was preserved with a vision of light perception or better, we find that the patient reported within three hours after the accident in 1 case; two in 2 cases; twenty-four hours in 4 cases; two hours in 1 case; five weeks in 1 case; two months in 1 case; six months in 2 cases; eight months in one case; twelve hours in 1 case; three weeks in 1 case.

Therefore, it would seem that the mere length of time the body has resided within the ocular coats need not necessarily influence the ultimate visual result, provided its residence there has not caused inflammation, or that it has not carried with it an infection, and provided that it has not become surrounded with exudate, rendering its removal impossible. Naturally, other things being equal, in the absence of infection, the sooner the body is removed the more likely is the result to be a good one, and yet the most active form of infection may become implanted within a few hours, as, for example, Case 18, and Case 24, and the eye be lost in spite of removal of the body and most vigorous treatment to prevent progression of the infection.

The foreign body was visible in the anterior chamber once, in the angle of the anterior chamber and partially im-

bedded in the ciliary region once, in the posterior portion of the eye through the clear media by means of the ophthalmoscope once, and, therefore, no method of localization other than direct inspection and ophthalmoscopic examination was required in these cases. The body was localized by means of the X-rays 15 times. Thirteen of these examinations were made by Dr. Sweet, one by Dr. Pancoast and one by Dr. Max Stern, and all of the examinations except the one by Dr. Stern, according to the method devised by Dr. Sweet. In each of these instances the body was found exactly in the position indicated by the skiagraphic examination.

In 13 of the 26 operations the extension point of the magnet was introduced into the vitreous. Of these 7 eyes were saved* and 6 were lost. In one of the "saved" eyes there was later a detachment of the retina. In 6 of the 26 operations the extension point of a Sweet magnet was applied at or near the lips of a suitably placed scleral incision, and all of these eyes were saved.

In 7 of the 26 operations the body was drawn into the anterior chamber. Of these eyes 5 were saved and 2 were lost. Both of the eyes noted as lost were, however, infected when they came under observation and their loss cannot be attributed to the operation. It is interesting to note that there were no failures when the body was drawn through a properly placed small incision in the sclera; but if the 2 eyes already hopelessly infected when they first were examined be excluded from the series of operations in which the body was drawn into the anterior chamber, there were also no losses with this method. The number of operations, however, is too small to permit the formulation of deductions on this point. It would seem to me from my own experience and from my observation of cases operated upon by my colleagues that each eye must be dealt with according to the conditions present when it is first examined. Of this I am persuaded that, if the foreign body can be accurately localized by the Roentgen rays, according to Sweet's method, or any other satisfactory method, and the position of the body be found to be such that a small incision may be made directly

*The word "saved" indicates that neither enucleation nor evisceration was required.

over it, or in its immediate neighborhood, through which it is drawn by a magnet—the Sweet model has proved most satisfactory—without the introduction of the instrument into the vitreous, the results are just as good as when the attraction of a giant magnet conducts the body from its place in the posterior part of the eye around the lens into the anterior chamber, from which it is subsequently removed. I am further persuaded that what I may call direct extraction after suitable localization presents no greater danger than the other method, and in many instances a danger not so great. Moreover, the traumatism of the delicate incision in the sclera to which the body proceeds by the shortest route is not greater, and, it seems to me, not so great as that produced by the body when it takes a long route into the anterior chamber, from which it must be removed by incision.

As I have already stated, each case is a separate problem, and if the foreign body, for example, has penetrated the cornea and lens and traumatic cataract already exists, it is, of course, to a certain extent a matter of indifference whether the foreign body in coming forward should wound the already injured lens. Again, careful examination will often reveal that the easiest route through which the body may be attracted by the magnet is the one which has proved to be the pathway of entrance. But under any circumstances the value of accurate localization, whether the giant magnet be used according to the Haab method, or whether an incision be made over the approximate position of the piece of metal, must add to the facility of the technique, and I agree with Dr. Sweet in his various publications on this subject, that localization by means of the X-rays is always an advantage to the patient and to the surgeon.

My own results are as follows: Eyes saved with good vision 38.4; eyes lost 30.8; eyes saved, which probably could have been improved by subsequent operations, 23 per cent.; eyes saved, but the ball somewhat shrunken, that is, phthisis bulbi, 7.7 per cent.

TRANSACTIONS

OF THE

Oto=Laryngological Section

OF THE

American Academy of
Ophthalmology and
Oto=Laryngology,

AT ITS

Ninth Annual Session,

HELD AT

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THE LARYNGOSCOPE,

St. Louis, Mo.

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PROCEEDINGS

—OF THE—

Section on Oto=Laryngology.

REPORT OF TWO CASES OF LARYNGEAL TUBERCULOSIS OPERATED ON BY THYROTOMY. COMMENTS ON THE OPERATION.

BY OTTO J. STEIN, M.D., CHICAGO.

Case One.

Personal History. A. M., female, age 22 years; colored, was seen for the first time in November, 1901, at my clinic at the Post-graduate hospital. The patient complained of hoarseness, which had been present since the previous spring during her residence in Colorado. Last winter, one year ago, had quite a severe attack of pneumonia, from which she recovered rapidly. With the advent of spring she first noticed a slight huskiness of the voice which continued for a short time, but instead of the voice improving it became worse, so that she was decidedly hoarse. This hoarseness has been present, with but slight changes, ever since. A slight cough has been present almost from the beginning, but, as the patient expresses it, it seemed to be entirely in the throat.

Family History. The family history seems to be good. Her mother and both her brothers and sisters are all living and in good health. The father died of pneumonia.

Examination of the Patient. The patient presents the appearance of a fairly healthy girl. Her usual weight is 112 pounds, but at present it is about 100 pounds. Aside from her hoarseness she claims to be well and strong. Her temperature is 99.5 degrees F.; pulse, 84. Cough is quite severe and is attended with a profuse expectoration, which looks mainly mucous with a slight admixture of pus, but no blood. There is present neither dysphagia, dysphonia nor dyspnoea. Examination of the nose and pharynx revealed nothing. The mucous membrane of the epiglottis appeared anæmic, while that of the

interior of the larynx was congested. The left arytenoid, in the region of the attachment of the vocal cord, presented an irregular like growth that appeared to be more a part of the arytenoid than any growth upon it. Its elevation I estimated about five millimeters, with a base of a spreading or infiltrating character. The surface of this growth was not to all appearances ulcerated, but that part of the left vocal cord that had its attachment at this point was very much thickened and slightly ulcerated. This ulceration was superficial and irregular in outline. Both the cord and its arytenoid were hindered in their free movements. The right side of the larynx was normal. The report of the medical department at the hospital as to the condition of the patient's lungs showed no positive evidence of tubercular involvement. The sputum, on repeated examinations, showed no tubercle bacilli.

Diagnosis. The intra-laryngeal picture in this case gave no positive evidence of a tubercular disease. But when studied in connection with her personal history and her general condition little doubt seemed to exist as to the true nature of the trouble. Nevertheless it many times becomes a matter of grave concern to us to establish with confidence and without doubt the absolute diagnosis of malignant and tubercular disease of the larynx. To the inexperienced the diagnosis as given in the average text book is misleading. The presence of tubercle bacilli in the sputum, the pulmonary signs, the local anæmias and the club like infiltration of the arytenoids are so often absent that to rely upon such findings is often disastrous to your diagnosis.

Prognosis. As is well known, the prognosis, as to the ultimate disappearance of the trouble, in most all cases of tubercular involvement of the larynx is poor. The more advanced the condition is the poorer the chances are for relief. In the very early involvement, where the morbid changes are but slight, and the condition is recognized at this time, which it many times is not, and where proper measures are instituted to prevent irritation of the throat, the chances for relief from further trouble are good. The earlier then that the condition is recognized, and the sooner measures are introduced to get rid of existing changes, the surer are we of restoring the parts to normal. This case presented a lesion confined as yet to a limited area on one side of the larynx. The larynx, to the best of evidence, seemed to be the active seat of the trouble at the time. The patient was otherwise in excellent general condition. The lesion itself was so situated and of such a character that any intra-laryngeal effort to completely remove it would necessitate repeated operations.

In order, then, to eradicate the condition completely, quickly and with the least amount of trauma to the neighboring parts, the extralaryngeal route seemed the more practical and effective.

Treatment. The operation of thyrotomy was performed without a preliminary tracheotomy. The thyroid cartilage was divided in the median line with a pair of scissors. Two traction sutures of chromatinized catgut were immediately passed through the two halves of the cartilage. These were afterwards used to suture the two halves together. Applying cocaine and adrenalin solutions to the interior of the larynx, a pair of long-handled scissors, curved on the flat, were used to quickly excise the diseased area, which included the entire arytenoid and the posterior half of the cord. An effort was made to cut deep and wide so as to circumvent the affected region through healthy tissue. Pure lactic acid was applied to the operated surface. The two halves of the thyroid cartilage were then brought together and tied with the catgut sutures used for traction purpose. The skin wound was closed except over the cricothyroid space, through which a small tracheotomy tube was placed. This tube was removed on the second day.

Granulations around the neck wound troubled us a little, as is quite often the case, but otherwise healing took place satisfactorily. The patient recovered a very fair voice, and her general condition remained good. She took on weight and when seen about a year ago there was no indication of a return of the trouble in the larynx. The operated side had cicatrized nicely.

The tissue removed was reported by the laboratory at the Postgraduate Hospital to be tubercular.

Case Two.

Personal History. A young man, W. McK., age 23, occupation, printer, consulted me in October, 1903, through the courtesy of Dr. Alfred Croftan of Chicago. He was referred on account of a cough and hoarseness that had been present, more or less continuously, for three weeks. Four years ago his health apparently was poor, and in August, 1900, he sought medical advice. Without any examination whatsoever his physician, he says, ordered a change in climate. Patient went immediately on a ranch in Arizona, where he remained, with a steady improvement in health until July, 1901, when he returned to Chicago. During the following two years he did not complain of his health at all. The patient is of the slender type of manhood, probably never weighing more than 130 pounds; of a somewhat nervous temperament, with strong sexual desires, which were

satisfied in excesses. Examination of the sputum for tubercle bacilli had been made on several occasions with negative findings. No history of hoarseness at that time.

Family History. Negative.

History on First Seeing the Case. He claims to have caught a severe cold three weeks ago, which left him quite hoarse. Since then the hoarseness has been constantly present, associated with a cough. The cough occurs more in spells, which are slight. Physical examination of the chest was made by Dr. Croftan but nothing suggestive of a tubercular condition was found. These examinations were repeated by Dr. Croftan during the several weeks the patient was under my observation and always found to be identical.

Examination of the Patient by Myself. He is slight of stature, weighs 115 pounds and is anæmic and nervous. Aside from his cough and hoarseness he claims to feel well and strong. Temperature, 99 degrees F.; pulse, 80; expectoration slight in quantity, of a watery nature, streaked with yellow, but no blood, and free of any tubercle bacilli. The hoarseness is not profound, nor is the cough severe. He has neither dyspnœa, dysphagia nor dysphonia. There is slight enlargement of a few lymphatic glands on both sides of the neck. Examination of the nose reveals a septum deflected to the left. His throat is severely sensitive to examination. The pharynx is irritable and reddened. It was necessary to cocaine the pharynx thoroughly in order to view the larynx. The mucous membrane of the latter was but slightly reddened. The contour of the arytenoids was not distinct owing to a filling-in of the more shallow parts. The right vocal cord was of normal color and appearance, and moved freely. The left cord could not be seen on account of the overlapping of a mass from above which seemed to be the ventricular band. This mass, which appeared to occupy the position of the entire left ventricular band, was deep red in color, of a smooth surface with no sign of ulceration, quite firm, immovable and to all appearances an infiltrate of the entire band. During the following few days, while keeping the patient under observation, two small spot like ulcerations appeared on the surface at the posterior end. This was the only ulceration that at any time was apparent to my examinations.

Diagnosis. On account of the lack of any positive physical findings of tuberculosis, the possibility of malignancy had to be considered. From its appearance alone, the mass in the left ventricular region, may have been either of malignant or tubercular character. The infiltrating character of the mass, shown by the interference with the free motion of the cord, suggested a malignancy. The involve-

ment of the entire ventricular band differentiated it from any of the benign neoplasms. An eversion of the mucous membrane of the ventricle might look not unlike a condition that we had, only that it would not be firm and immovable. Syphilis scarcely entered into my calculations because the local picture lacked almost every characteristic of that disorder. The youth of the patient and a careful analysis of his personal history left my mind free of any doubt that occupied it at first as to the possibility of a malignant condition. That it was a primary laryngeal tubercular affection, I rejected, on account of the suspicious early history, and on account of the frequent negative physical findings in similar cases.

Prognosis. The prognosis in this case, like in the previous one, appeared to me more hopeful if radical measures were employed. The quiescent state of the disease in the lungs, the sudden appearance in the larynx of an active tubercular process situated, so as to make its entire removal, for the purpose of complete exenteration of the diseased process, by intra-laryngeal methods, impossible argued well for a method that would allow free and easy access to the parts in order to allow the removal of all of the tubercular tissue. The patient was under observation two weeks, during which time he was most carefully, nourished, directed, watched and treated. The throat was not treated at all, but only examined about every other day. I noted the beginning of the tiny spots of ulcerations and the increase in the cough. The infiltrating character of the growth convinced me of the uselessness of attempting removal of all the diseased tissue by any intra-laryngeal procedure. Believing that the active process was centered in the region of the left ventricular band that delay would lead to extension of the process within the larynx and a lighting up of the latent condition in the lungs, I advised thyrotomy as a measure for exterminating this disseminating focus.

Treatment. The operation of thyrotomy, as proposed, was carried out. After division of the wings of the thyroid cartilage with a pair of scissors and bringing the interior of the larynx to view, I found the parts in a condition just as they appeared to me in the mirror, with the exception, that at the extreme posterior end of the left cord there was a small ulceration. As the cord could not be seen at all with the mirror on account of the over lapping of the tissues above, this, of course, could not have been discovered. The involved ventricular band was removed, with a pair of scissors, in toto. The excision was planned so as to include the healthy tissue surrounding the band if possible. The ulcerated area at the posterior end of the vocal cord was also removed. To the denuded surfaces

full strength lactic acid was applied. A small tracheotomy tube was left in the cricothyroid space in order to anticipate any obstruction to respiration that might arise as a result of swelling. No such difficulty arose, however, and the tube was removed the following day, allowing the small opening to close by granulation. The patient's convalescence was uneventful. At no time after the operation was there any wound fever. On the second day he was sitting up, and on the sixth day he left for home. The hoarseness disappeared rapidly, so that within a week or ten days his voice was clearer than prior to the operation. He had gained six pounds in weight and felt in excellent condition. A small sinus persisted where the tube was and this I thought to close by clipping off the exuberant granulation tissue around its opening and putting in a couple of sutures. But this spot refused to heal and gradually the healed surface over the thyroid became involved in a local tubercular disturbance. At first there appeared to be an intense dermatitis, the increased thickening of the thyroid cartilages bespoke a chondritis, the scar line gradually melted down, the skin edges appeared mouse nibbled and granulations sprang up rapidly in an effort to repair the slow but insidiously destroying process. After a month's time the parts were under control again, and in another month the wound had healed to within about half an inch. At this time, under the influence of his mother, the patient neglected my further advice, and placed himself under the treatment of a Christian Scientist. After three months he returned to me with but a fragment of his former health. The "Scientist" advised him to return to his doctor, as he could not do any thing more for him. Examination of the chest showed extensive tubercular involvement of the lungs, while the patient showed the great emaciation and weakness that was present. The appearance of the neck wound was just as it was three months previous. The exhaustion of the patient, at the time of this last visit, prevented me from obtaining a view of the interior of the larynx, and as he shortly afterwards left the city in quest of improvement by camping in the woods, I am still ignorant of the appearance of the interior of his larynx and the region operated upon. Since writing the above the patient's sister reports to me that the wound in her brother's neck has entirely healed, that his voice has returned to a considerable degree and that his general health has improved. He anticipates leaving for a southern climate this fall.

The piece of tissue excised and examined by the Zeit Laboratory, showed it to be tubercular.

In discussing the subject of thyrotomy, it is of interest to note that this operation was quite frequently performed in the beginning of

the laryngoscopical era—the '50's. At that time the laryngeal mirror for the first time, revealed to the eye of the laryngologist the secrets of the inner recesses of the throat, but it took some years before he overcame the fear of invading these parts via naturalis. Hence thyrotomy became the popular method of operating for all intra-laryngeal neoplasms, benign or malignant. But with the advent of local anæsthesia with cocaine in 1884, the intra-laryngeal route took precedence as the method par excellence, especially for benign growths; and with time, experience in technique and improvements in instruments it has become almost the exclusive route for larynx operations. But here as with everything else, there is a tendency to forget the old entirely for the new. The pendulum swings too far and we can never expect to reach the acme of our results until it returns to the happy medium. That thyrotomy has a place in laryngology goes without challenge, that was settled by Bruns of Berlin in 1878, during the controversy that waged between the general surgeon and the laryngologist, and besides this, the brilliant results achieved in late years in the treatment of malignant neoplasms of the larynx speaks eloquently for the operation. But that it is useful as a therapeutic agent in tubercular disease of the larynx will yet find many controvertists. Therefore, I believe every particle of light that may be shed upon the subject, by those who have had the experience in this work, will aid us in ultimately formulating something more decisive than the knowledge we have today upon the exact value of this operation in tubercular laryngeal disease. It is with this purpose therefore that I present to this body of laryngologists the report of my two cases.

It is impossible for us to support substantial views on the exact value of thyrotomy in tubercular disease of the larynx, on account of the comparatively few cases that have been reported as treated in this manner. Our text books, with few exceptions are silent on the subject. The review of the literature by Schech of Munich and Taptas of Constantinople reveals in all only 21 cases. One of Billroth's, one of Denio's, one of Henning's and one of Schonborn's died either of shock or of an intensification of the general process. In one of Hopmann's, two of Schonborn's and one of Kuster's, the larynx symptoms improved but death resulted from pulmonary progress. In one of Schnitzler's, three of Hopmann's one of Koch's, one of Schonborn's, and one of Kuster's, there was a happy improvement, both local as well as general. One of two cases of Grünwald's showed no sign of any return of the trouble 13 months afterwards. Hopmann's case of a minister who 11 years after the operation still con-

tinued the use of his voice in the pulpit, is celebrated. Kijewski, Baurowicz and Henning each reports a successful case.

The case Taptas reports cannot be classed under this heading, as the operation consisted of an excision of one-half of the thyroid cartilage, which was necrosed and associated with it was a large abscess. The result in this case though was good. Aside from the above cases I have been able to find the report of the following: A case of Gersters of a tubercular tumor of the larynx causing dysphagia and dyspnoea was cured of its laryngeal symptoms. Lack operated on a case in which the diagnosis was epithelioma but which proved to be tubercular. The immediate surgical result was beautiful. Four months later glands in the neck enlarged, which were found to be tubercular on removal. The improvement continued. Goris reports two cases, one of which he showed two years later, before the Belgian Laryngological Society, as cured. The other one had a tubercular infection of the wound, similar to one of my cases, but it eventually healed. Bond and Symonds, each, report two cases. One of the former is said to be successful. Symonds declares both his cases unsuccessful. Moritz Schmidt, in his book, (1903), refers to seven additional cases, all successful and not already mentioned by me. One was a case of Sokolowsky's, two of Kuttner, two more of Goris, and two of his own. The first one of his own after six months, showed a nicely healed larynx; the second was a primary tubercular tumor in a man 48 years old who was seen in consultation with Pinner. The latter operated and after two years there has been no sign of a return.

The total number of cases that I have been able to find a record of has been 36, which with the two of my own, herewith reported, makes in all 38 cases. In order to analyze the value of these statistics it seems but just and reasonable to consider for a moment the prognosis of this disease. Schech says:

"The number of cases that completely heal and that remain so are extremely few. In most cases there is, sooner or later, a return of the condition, which is often worse and involves a greater area than the original, or the pulmonary disease makes such rapid strides as to soon end the life of the patient. Similar views are held by Moritz Schmidt and Heryng."

It is self-evident that the prognosis depends much upon the individual; his resistance; his powers of recuperation; his intelligence to carry out instructions as to mode of living, hygiene, diet, etc. Again the period of therapeutic intervention must be considered. Early cases are easier benefited than advanced cases. Control of the pul-

monary condition enhances the prospects for the larynx trouble. Then too, the prognosis as to the relief of symptoms comes prominently in question. Dysphagia and dyspnœa are the two important ones.

Therefore all of these questions are to be considered in summing up the value of any particular line of treatment.

In the class of cases suitable for treatment by thyrotomy, the prognosis, to my mind, is better than in the more common varieties of larynx tuberculosis, and this even without any local treatment. But, good as it is, it is never more than a hopeful prognosis. Everything depends more or less, upon the maintenance of a general health parity.

In the 38 cases just referred to, four died soon after the operation, without any improvement in the larynx. Four improved locally, but died shortly afterwards from pulmonary progress. Four are reported unfavorable, but to what extent I have not ascertained. The remaining 26 were benefited locally, and in many cases generally.

In the opinion of the author the following are the indications for the operations in tubercular laryngeal disease:

1. Limited and circumscribed involvement of the larynx, (especially tubercular tumors) particularly one-sided.
2. Before, or at the very earliest appreciable sign of ulceration.
3. Before any appreciable sign of pulmonary involvement, or at least during a quiescent pulmonary period with a well supported general physical condition.
4. In extremely sensitive and nervous patients, who do not allow unrestricted access to the interior of the larynx via naturum.

DANGERS AND COMPLICATIONS OF THE OPERATION.

1. Shock.
2. Aspirating pneumonia.
3. Incomplete operation, resulting in a return of the trouble in loco and in extensio.
4. Undue injury to the parts during the operation.
5. Tubercular infection of the wound.
6. Stenosis of the larynx from synechias, granulations or edema.

All of these dangers and sequelæ may be minimized to the utmost by a careful selection of cases; strict attention to the carrying out of

the technique of the operation; rapid but complete work and close observation to the after care.

The advantages that the operation seems to offer are, accessibility, simplicity and thoroughness. Accessible by a median neck incision, the cartilage is easily divided and a most thorough exposure of the interior is readily made, allowing great leniency in the use of instruments in the excising process.

CONCLUSION.

Thyrotomy, for tubercular disease of the larynx, should be undertaken only after a most careful study of the case.

As a remedial agent it should be considered only in a certain limited class of cases, as considered elsewhere.

That to prove effective it should be performed early, and especially in the so-called or apparently primary cases.

It should be performed in the absence of pulmonary signs, or at least during a latent period of a pulmonary condition with a good general physical condition.

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MEDICAL TREATMENT OF LARYNGEAL TUBERCULOSIS WITH SPECIAL REFERENCE TO THE USE OF FORMALIN.

BY LORENZO B. LOCKARD, M.D., DENVER, COLO.

"Tuberculosis is one of the most frequent diseases of the larynx. It is usually fatal. Very few cases recover."

"Occasionally a case recovers; nearly all die."

These two statements emanating from two eminent laryngologists, the first twelve years ago, the other of recent date epitomizes the old and new prognosis as commonly held and demonstrates with what hopelessness the physician takes up the gauntlet of battle.

Are these statements justifiable today and has a decade of effort warranted nothing more than a mere transposition of words?

In no other disease is a statistical report of so little value for we are dealing not with a process of standard or even fairly equable conditions but with one where each is a law unto itself, yet when we contrast the percentage of recoveries given by Bosworth in 1893—less and 1%—with those quoted by Solly in 1904, computed for Colorado, we see that progress has been real and substantial and that this wide-spread pessimism is illogical.

He says: "Taking the results in laryngeal cases without considering the ultimate fate of the patient, there was permanent arrest of the local disease in 64%; temporary arrest in 5% additional cases in which the tissues again broke down shortly before death. Looking at the ulcerated cases alone, 50% healed permanently, 10% temporarily." Levy, in 1900, reported only 26 deaths in 86 infiltrative cases. Of 60 ulcerative cases 37 grew worse or died and of those without involvement of the epiglottis or aryepiglottic folds, only 10% died or failed to improve.

The present day warrants, I believe, a still more hopeful outlook and my recent experience leads to the belief that more than one-half of the ulcerative cases can be brought under permanent control regardless of the eventual outcome of the pulmonary lesion.

For its treatment no specific is known and the vast number of agents utilized is the most eloquent tribute to their general inefficiency, and yet the outlook each year becomes more encouraging. What is the explanation of this apparent paradox?

It rests largely with the earlier recognition of the incipient lesions; more universal utilization of the essentials of treatment—local cleanliness, vocal and general rest, establishment of physiologic nasal

respiration, open air life under favorable climatic conditions, etc., and to a considerable degree upon the mental attitude of physician and patient.

Believing in its incurability the physician formerly treated these cases in a perfunctory manner, striving after the single goal of euthanasia, while today, with a deep appreciation of the necessity of constant vigilance and supervision and its not infrequent reward, his increased zeal and confidence bring greater success. In the treatment two general lines may be distinguished; the palliative and the curative. At certain points these lines converge, notably in all matters pertaining to nutrition and local and general hygiene, but with the palliative otherwise we have here no concern; its indications, except as to whether they be surgical or medicinal are clear, universally known and met.

In considering the curative treatment one is confronted by an appalling array of remedies each endorsed by some observer as standing pre-eminent. There is no specific, and probably never can be for a disease of such manifold types, but the one which fulfills the greatest number of essential requirements, each in a degree equal to any other substance, approaches nearest the ideal. The requirements common to all lesions are cleansing and bactericidal, and for special conditions, stimulative, absorbent or resolvent, caustic and sedative properties.

In meeting these various indications one remedy stands alone, without an equal in its field of universal usefulness—Formaldehyde.

Preliminary to all treatments, the mucosa must be cleared of tenacious mucous or pus and so maintained, and formalin meets this requirement as successfully as Dobell's or any of the other numerous detergents, and for this purpose may be used in weak solutions ad libitum. At the same time it exerts a more profound antiseptic effect than can be attained with any other substance. A solution as weak as 1 to 100,000 prevents the development of bacteria and it is germicidal in a strength of 1 to 75,000.

A 1 to 10,000 solution arrests the growth of the germs of anthrax, cholera, typhoid and staphylococcus pyogenes aureus, and it is markedly superior to corrosive sublimate in solutions of a strength which can be tolerated.

This property would of itself make it a valuable remedy in the treatment of any tubercular process where it is possible to bring it into direct contact with the involved structures as is the case in laryngitis.

That it is of great value in tuberculosis of other organs there can be no question.

According to Lamarque a 1% solution used in cases of tubercular cystitis stops hæmaturia, relieves pain and lessens the frequency of micturition, when every other remedy has failed.

In tuberculosis of the middle ear, irrigation with weak solutions are more effective than any other single procedure.

As has been shown, formalin is prohibitive to bacterial development in a strength of 1 to 100,000 and positively germicidal in 1 to 75,000, and since we can use in the larynx with perfect safety sprays as strong as 1 to 150, it is conclusive evidence that we attain a considerable germicidal effect, and this action is expended not upon the lining membranes alone but upon the deeper tissues as well, owing to its rather unusual penetrative powers.

In lesions of an ulcerative type lactic acid has long been considered the remedy par excellence but in my experience the stronger solutions of formalin have seemed even more efficacious.

It has all the virtues of the former with one or more peculiarly its own. Severe pain not infrequently follows the applications of strong lactic while formalin solutions of equal potency occasion nothing more than momentary smarting with considerable subsequent anæsthesia. Its great superiority, however, rests in its safety, which makes it feasible for the patient, by home use, to keep up a continuous cleansing, antiseptic and stimulant action, a desideratum of high importance. No other remedy has given me as satisfactory results in this form of the disease and under its influence I have seen many cases completely heal that previously resisted all other remedies. As demonstrating this, I hope to show the following case:

Mr. W. M., æt. 32. In January, 1902, six months after pulmonary tuberculosis was diagnosed, there developed complete aphonia with considerable dysphagia, and two months later, upon his arrival in Denver, he presented the following picture:

Entire epiglottis deeply ulcerated with loss of nearly one-half its substance; ventricular bands so infiltrated as to partially overlap the cords with ulcerations at the most prominent point of each. The left arytenoid twice the normal size and extensively ulcerated. Both cords infiltrated and ulcerated throughout with considerable masses of granulation tissue at their posterior attachments. The interarytenoidal sulcus infiltrated and ulcerated.

Treatment, of which formalin constituted the most important part, was instituted with considerable improvement at the end of three months. At this time I substituted lactic acid with the occasional use of guaiacol with continued retrogression when at the end of eight weeks the use of formalin was resumed. By the following January

the ulcerations were healed except for one small spot on the under surface of the epiglottis and the infiltration of the ventricular bands and ary-epiglottic folds had almost disappeared.

At this time I left the city for four months and the patient was under the care of a colleague, who, having no faith in this treatment, used lactic acid and methylene blue. Upon my return the condition was worse than at the first examination and a hopeless prognosis was again made. Under the old treatment, however, the condition rapidly improved and six months later he accepted a position as a retail salesman which he has since uninterruptedly held.

In examining the larynx today, were it not for the distorted epiglottis and slight scarring at several points, one could have no suspicion that it had ever been the seat of tubercular disease.

While fully the equal of lactic in the ulcerative type, it is in the infiltrative cases and especially where vegetations exist, that its chief superiority is manifest. The lactic cannot act through an unbroken membrane and to be effective it must be used in the form of sub-mucous injections of a moderately weak solution, 10 to 20%.

Iodine, ichthyol, resorcin, creasote, menthol in oil and the various phenol combinations, after more or less extended experience, have seemed inferior to either the formalin or lactic and personally I now use the latter, only in exceptional cases.

T. J. Gallaher, one of the pioneers with this method, whose experience with it has been extensive, says: "It is the most satisfactory remedy I have ever used in infiltrative cases."

For a time sub-mucous injections of formalin were tried, but were not found to possess any advantage over the simple rubbings, added proof of its penetrative powers.

When vegetations or infiltrations are localized or excessive, they should be surgically removed provided the general conditions are favorable; but after all the tissue capable of surgical treatment has been dealt with, or primarily in case operative procedures be deemed inadvisable, the frequent use of formalin is generally most effective. That its influence in the reduction of hyperplastic tissues is a direct one was strikingly shown by a recent case of pachydermia laryngis where the continued use of this drug caused gradual shrinking with complete restoration of the voice. This action is likewise shown by its effect upon aural granulations, whether they be tubercular or simple inflammatory.

It may, under certain conditions, produce some anæsthesia but this power is too slight and unreliable to be depended upon. It has a distinct sedative effect but rarely sufficient to permit the withdrawal

of other remedies of this class. It is credited, in so far as I have been able to ascertain, with but one deleterious result; the possible production of local dry gangrene. While the danger of this has been mentioned it must be an accident of extreme rarity, for during a period of more than four years I have used it extensively in an infinite variety of patients and lesions without once seeing any evidence of such a complication.

In only one type of the disease, perichondritis of the arytenoids—has it proved inefficient and I believe all other agents are equally so. Partial resolution may result but where true perichondritis has occurred, not a mere œdema, complete restoration to the normal rarely, if ever, ensues, unless through the medium of surgical procedures. It is in this condition that I have seen the only favorable results from photo-therapy. The use of the concentrated rays of the arc light, as advocated by Freudenthal, has frequently resulted in great lessening of a dysphagia that resisted all other means. This has occurred in many cases but never has there been the slightest change in the appearance of the tissues, its sole action seemingly being one of more or less prolonged anæsthesia.

The effect of the X-Rays has been even more disappointing.

Some time ago I carefully selected a series of cases, representing almost every known stage of the disease, and placed them under the care of various experts in the use of electricity. Some were treated daily, some at longer intervals; various tubes were used and daily laryngeal examinations were made without once seeing evidence of the slightest improvement. Indeed, the effects seemed sometimes unfavorable, the marked reactions causing some increase in the subjective symptoms. In using formalin the key to success is the maintenance of continuous action and it is to the neglect of this, I believe, that the many negative reports may be credited.

In the average case it should be used according to the following method: After thorough cleansing with a one-half per cent solution, and the previous application of cocaine, the parts should each day be vigorously scrubbed with a solution of from three to ten per cent, depending upon the nature of the lesion and the susceptibility of the individual. In addition to these daily treatments the patient should use a spray, about 1 to 250, every three or four hours. The usual method, according to the literature, is to use the stronger solutions once or twice a week with the use of simple detergents in the interim, thus violating the entire rationale of the treatment.

Formalin should never be used blindly to the exclusion of all other remedies for other substances at certain times and in certain indi-

viduals may give better results, and while I have come to consider it the sheet anchor of medicinal treatment and rarely supplant it, it is invariably supplemented by other approved procedures. It is the most satisfactory remedy today not because it fulfills any of the attributes of a specific; not because it is invariably superior to all other agents, and not because it always noticeably decreases the period during which treatment must be maintained, but because of the following facts:

1. It surpasses all other bactericides in solutions of a strength which can be tolerated.
2. In tubercular ulcers it is fully the equal of, and probably superior to, lactic acid.
3. Its effect upon vegetations is prompt and pronounced.
4. In infiltrative cases it is by far the most satisfactory remedy.
5. It possesses some anæsthetic properties.
6. It is the only remedy of the curative class that can with safety be placed in the patient's hands, thus maintaining a continuous cleansing, germicidal and stimulant action.
7. Its field of usefulness comprises all of the varied types of the disease.

THE PROGNOSIS OF LARYNGEAL TUBERCULOSIS.

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It would seem hardly necessary to repeat, especially before this association, the warning against condemning all cases of laryngeal tuberculosis. Unquestionably many cases are absolutely hopeless from the start, but this does not apply to all, and here as in other diseases, it becomes necessary to differentiate stages and varieties of the affection. As stated by Dock in his admirable address, "prognosis means not merely recognition of the name of the disease, but a knowledge of the nature of the disease, still incomplete, but rapidly gaining in fullness and accuracy," and so as our knowledge of the nature of this disease, its various modes of manifestation, its different pathologic processes, become more clearly recognized and recognizable, our understanding of its course and termination must necessarily change.

It is extremely difficult to prevent the pendulum from swinging too far, and this is particularly noticeable in those diseases which from time immemorial have been considered hopeless and regarding which a pessimistic view has become an established fact. One successful or favorable outcome in a case of this kind is liable to so raise

the hopes of the observer that an extreme optimism is established and quite as much harm done as though the opposite still obtained.

We must go on studying with calm analytical judgment, case after case, separating and classifying the various stages and attempting by a careful diagnosis and by the observation of experience to arrive at the true scientific position. No matter how hackneyed our reiterations become, we must nevertheless continue the crusade against snapshot hopeless prognosis, which denies to the patient even an attempt at relief, to say nothing of cure, and also against the too hopeful prognosis, which encourages over treatment and defeats the very object it is intended to attain.

The relation between pulmonary and laryngeal tuberculosis must be considered from two standpoints, namely, the influence the laryngeal involvement has upon the pulmonary and that of the pulmonary disease upon the progress of the laryngeal complication. By far the major number of cases of laryngeal tuberculosis occurs during the course of tubercular infection elsewhere, principally in the lungs, and is therefore secondary. We frequently see pulmonary cases progressing apparently favorably, when suddenly or gradually, slight hoarseness attended with indefinite sensations in the neighborhood of the larynx manifest themselves. A laryngoscopic examination may reveal a deposit of gray tubercles with swelling of the arytenoids of a pale edematous character, or there may be seen a slight, red infiltration, involving the vocal bands or the inter arytenoid commissure. In the former, in which distinct gray tubercles with edematous swelling present themselves, one may conclude that the laryngeal infection is of a serious type, which will rapidly increase the patient's unfavorable symptoms now developing and which itself will follow an unfavorable course. On the other hand those cases of simple red infiltration may mean nothing more than a catarrhal inflammation in a tubercular subject, and if unfavorable general symptoms develop, the larynx cannot be held responsible for them. These cases progress favorably so far as the laryngeal complication is concerned.

Again the bearing of the pulmonary disease upon an already infected larynx is of extreme importance. Definite cases of laryngeal tuberculosis of the infiltrative type especially, as well as some cases of the ulcerative type, improve gradually so long as the pulmonary or general tuberculosis continues to improve. When, however, the cough becomes worse, the temperature remains high, night sweats redevelop and other symptoms of unfavorable progress manifest themselves, it is not uncommon to see the larynx rapidly pursue an unfavorable course.

The two important functions which are materially involved in laryngeal tuberculosis are phonation and deglutition. Slight hoarseness gradually increasing to complete aphonia occurs in all cases of laryngeal tuberculosis sooner or later. True, there is a certain proportion of cases in which the involvement is only of the epiglottis and in which the voice is not materially affected. Sooner or later, however, extension to the interior of the larynx, to the arytenoids and to the vocal bands causes voice symptoms. Both the infiltrative and the ulcerative types cause vocal disturbances. In both of these pathologic varieties a favorable result may be brought about and the voice be eventually restored, if not to a normal, still to a fairly useful condition. Much will depend, in both instances, upon the situation of the lesion. The infiltrative variety may involve a large portion of the larynx, including the vocal bands, and if other conditions prove favorable, absorption may be induced and the voice improve. A large percentage of infiltrative cases never goes on to ulceration. The infiltration becomes more marked or more firmly organized and cure may be said to result by virtue of fibroid changes, which do not participate in active tubercular destruction. Many patients are extremely anxious, even to a condition of morbid anxiety for a restoration of the voice. Where absorption can be brought about, the patient will be restored to a happy existence. In many cases, however, this is not possible, and here it becomes our duty to assure the patients that the existence of the hoarseness is not necessarily an evidence that the general disease will progress unfavorably, and that so long as the pulmonary or other complications do not cause unfavorable developments, the larynx need not be feared. Restoration of the voice in ulcerative cases takes place where the ulcerations have not destroyed too much of the vocal bands and where the edematous swelling surrounding the ulcerations subsides. Here the activity of the process, the presence or absence of distinct deposits of gray tubercles and the general condition of the patient must be our guide.

Disturbance in swallowing may be of two characters. Swelling of the epiglottis or the ary epiglottic folds may cause great difficulty in deglutition without pain because of mechanical interference. Ulcerations situated upon the epiglottis, ary epiglottic folds or the arytenoids cause difficulty in swallowing because of intense pain. Here again the activity of the process, as indicated by pale edematous swellings with deposits of tubercles indicates a probably unfavorable outcome. Unless the dysphagia and odynophagia can be readily

ameliorated by proper treatment, the patient's general condition visibly fails and the larynx makes a corresponding unfavorable termination.

Experience has taught us that the nature of the lesion controls to a considerable extent the prognosis. There are different forms of the infiltrative type. Some partake of the nature of slow connective tissue deposit. These may be considered favorable types. Others are pale edematous infiltrations with deposits of gray tubercles plainly apparent beneath the mucous membrane. These are unfavorable types and usually go on to extensive ulcerations. The ulcerative variety is also of several kinds, the main point of distinction being the activity of the ulcer and the rapidity with which it develops.

The situation of the lesion is also of much importance, intra laryngeal manifestations showing much more tendency to heal than those situated upon the epiglottis or the ary epiglottic folds.

As in other tubercular lesions the earlier the laryngeal complication is recognized, not only in regard to its own development, but also in regard to the time it manifests itself during pulmonary or other lesions, the more hopeful does our prognosis become. Also, as in other tubercular lesions, the more favorable the patient's surroundings are the more may we hope for improvement.

The prognosis is materially influenced by the environment of the patient, his ability to surround himself with the comforts of life, with proper rest to the voice and suitable hygienic and climatic conditions.

SUMMARY.

1. The prognosis of laryngeal tuberculosis depends upon our understanding of its nature, its varieties, its stages.
2. All cases are not hopeless, nor should one cure cause too much optimism.
3. Laryngeal tuberculosis materially influences pulmonary and general symptoms.
4. Per contra, it may possess no bearing upon the general course of the disease.
5. The course of the pulmonary invasion markedly affects the laryngeal complication.
6. Disturbances of phonation are due to infiltration, to ulceration or both combined. In many cases the voice may be much improved.
7. In extreme infiltration where improvement may not be obtained, the process does not necessarily go on to ulceration, or cause general decline.

8. Disturbances of deglutition may be due to swelling without pain or to pain, namely dysphagia or odynophagia, and here the character of the lesion influences the prognosis.

9. Intra laryngeal lesions improve more rapidly than those situated on the epiglottis or any epiglottic folds.

10. Early recognition of a primary lesion or secondary complication is essential to a favorable termination.

11. The patient's environment and his ability to rest his voice influence the prognosis.

12. Suitable hygienic and climatic conditions are essential to a favorable outcome.

DISCUSSION ON THE PAPERS OF DRS. OTTO J. STEIN, L. B. LOCKARD,
AND ROBERT LEVY.

Dr. H. W. LOEB (St. Louis). These papers practically comprise the whole subject, the medical and surgical treatment and prognosis, and if I do not cover the ground, I hope I will be pardoned. I am much interested in the reports of Dr. Stein; with reference to the two cases treated by thyrotomy. I may say there is no reason why it should not be performed in favorable cases, and these two cases reported it would seem were unusually favorable from the fact that only one side of the larynx was affected in each case and that prompt improvement followed, certainly in the first, and probably in the second. The crucial point in determining the result is the microscopic examination; the essayist states that the pathologist found the cases tuberculous. I, personally, in such cases, would want a very definite statement from the pathologist. I had a serious result in a similar case, which makes me chary of accepting any other than a full statement of the pathological findings. The laryngoscopic picture was that of laryngeal tuberculosis, but after two large sections had been removed for diagnostic purposes and pronounced cancerous by the pathologist, the larynx was removed and found to be tubercular.

In the experience I have had, such favorable cases are uncommon; but where cases of that type can be had, and where the consent of the patient can be obtained for such an operation, after the various phases of the operation have been pointed out, I think it is indicated and should be performed. This conclusion is supported by the good result which Drs. Day and Jackson, of Pittsburg, had in cases of typhoid fever affections of the larynx, in which they reamed out the whole larynx with good result. There is no reason why, if necessary, the larynx should not be reamed out and the pain relieved. Dr.

Stein's report will bring the subject more clearly to our attention.

With reference to the use of formalin, the report is exceedingly interesting and encouraging. It is probable that such a good report may be had in Colorado; but not in Missouri, at least, not of those cases which I have had occasion to see. No treatment has given anything like such favorable results. I do not know that the treatment given by Dr. Lockard is in use to a great extent in Missouri. He seems to think the good results can be laid to the bactericidal effect of the formalin. I do not think it will be accepted that you can render the whole larynx aseptic with formalin. You cannot reach the under surface even by scrubbing. I do not believe it necessary to kill all the germs to cure these cases. But if the germs are removed by this agent, they may light back there in a few minutes, especially as the patient is coughing up this material all the time.

Dr. WM. LINCOLN BALENGER (Chicago). We can not attribute the after history of our cases entirely to the treatment that has been given them, as the case I will narrate well illustrates. About five years ago I had a young woman under my care who had laryngeal tuberculosis. It was almost impossible to get a view of the vocal cords. The lesion was on both sides and involving chiefly the false cords and that region. There was considerable ulceration, and complete aphonia. The patient's flesh was reduced some pounds in weight and her general health was poor. I tried to get her into a certain hospital, but did not succeed, and was going to operate by the inter-laryngeal method. She finally passed from my observation. She came to me again a few months ago, and had gained 25 pounds in weight. She still had aphonia, but her general health was excellent. I advised that she let well enough alone. This is a case which, had I operated, would have gone on to either resolution or death, probably to death, but by some slip in the arrangements I failed to operate on her; she was in excellent health, had gained 25 pounds in weight, and may continue indefinitely in this state of health, though I presume there will be a recurrence of the acute process.

Had I operated, and had good health and increased weight followed, I would have attributed the results to the operation.

As I said, this case illustrates the fact that all results or after conditions following operations or treatments of laryngeal tuberculosis are not necessarily due to said operations or treatments.

Dr. H. B. HIRTZ (Milwaukee). I wish to congratulate Drs. Lockard and Levy on their results in the treatment of laryngeal tuberculosis. I think Dr. Loeb struck the keynote when he said cures are

made here, that are not made in the East. In Milwaukee, we get many of these cases, but as a rule they do not do well. Once in a while much improvement occurs under routine treatment. The formalin treatment, I have never tried, but the lactic acid treatment, using as much as the concentrated solution, invariably gives improvement, if the curette has been previously applied. Ulcerative conditions heal and appear to remain so for a time, but recurrences or fresh out-breaks may be said to be the rule. Improvement, in my opinion, in most of these cases, is dependent upon the improvement in the general condition, and I believe it is the general improvement which results in this locality that accounts largely for the rapid local improvement. I do not mean to decry the benefit of local treatment, because I believe thoroughly in it, but I simply wish to remark that the results we get in the East are not nearly as good as the results the doctor gets here. I shall try the formalin treatment and watch the results with much interest.

Dr. DUDLEY S. REYNOLDS (Louisville, Ky.). I did not intend to take part in the discussion, but I wish to refer to the fact that about three years ago I had two cases of laryngeal tuberculosis coming within the same week of time. Both of these I sent to Cripple Creek—not because I had any preference for Cripple Creek over Denver, but because in suggesting Colorado, the patients suggested that locality. Both of them greatly improved in voice, in general health, accumulating considerable fat. One has returned to Kentucky and gone on a farm, and has been there about six months, and already he has begun to lose a little in flesh and look a little pale and manifest symptoms of general nervous disturbance. The other writes that he has escaped the citizen's committee and military authorities, is doing well, and intends to stay there as long as he can.

Dr. H. V. WÜRDEMAN (Milwaukee). I wish to endorse Dr. Hitz's remark in regard to our lake climate. The person who acquires tuberculosis of the larynx in our climate is dead in a year, despite treatment, unless he goes to Colorado or San Antonio. I have sent five cases of varying degrees of laryngeal tuberculosis in patients to San Antonio for treatment, several to Denver and further south in the state of Colorado. I believe firmly that it is the outdoor, clear, ozonic air that does the work, and not our local treatment, although it is certainly necessary, even out here, to have a certain amount of cleansing and antiseptic treatment.

Dr. J. A. L. BRADFIELD (La Crosse, Wis.). I find pulmonary tuberculosis with marked laryngeal involvement nearly always fatal

in our locality. Last year I saw a lady, aged 34, confined six weeks previous, failing rapidly. Marked temperature, apex of left lung being markedly involved with typical laryngeal involvement. Child weaned, and creosote administered. Temperature became normal and lung cleared up and larynx and voice became normal. Now I do not say all such cases will die.

Dr. THOS. J. GALLAHER (Denver). The prognosis in laryngeal tuberculosis might be considered under three heads, namely, that of the lesion, voice and life. The prognosis in regard to the lesion will depend upon its area, depth and location. The more extensive the area involved and the greater the depth of ulceration the more guarded must be the prognosis. Prognosis as to voice will depend upon the extent of involvement of muscles, vocal bands and the freedom of the articulations. In regard to prognosis of life we must carefully consider the environment of the patient and amount of pulmonary disease. I have never seen a case sent here with laryngeal tuberculosis improve very much unless the pulmonary condition improved. This has been my universal experience. In regard to Dr. Würdemann's statement that climate does it all, I will say that I have never seen a spontaneous cure of laryngeal ulceration in this climate but on the other hand many cases of cure under energetic and appropriate treatment. When shall we call a given lesion cured? We must reserve the term *cure* for those lesions in which the diseased tissue is replaced with scar tissue or in which the tubercle is impregnated with lime salts. When the fibroid change occurs there is only an encapsulation and an arrest of the process but the tubercle is not destroyed and hence arrest only is made. Arrest of the process will be indefinite but may never break down if the patient remains in suitable climate. Many simple infiltrations remain quiescent indefinitely. I do not deem it wise to curette the limited infiltrations as there is danger of opening up new channels for further infection. The curette should, however, be used freely on the ulcerations and thorough local treatment instituted.

All vegetations should also be removed before local measures are adopted. As a local application I am very partial to formaldehyd and since my first paper on the use of formaldehyd, 1898 Amer. Med. Assoc., Denver, I have been pleased still more. The treatment consists of the local application and spraying of formaldehyd followed with different powders such as orthoform and aristol, and deep intratracheal injection of oil of cinnamon, eucalyptol, etc. In addition to removing the patient to a suitable climate I deem the local laryngeal treatment imperative.

Dr. JOS. BECK (Chicago). Dr. Lockard referred to the use of the X-Ray in tubercular laryngitis, but did not mention how he used the X-Ray, whether through the mouth or through the neck—externally.

Dr. LOCKARD. One used the mouth tube and one used it externally.

Dr. BECK. Now it is a fact positively proven that the X-Rays or any other rays we have, as for instance, the Finston, or radium, to be effective are not deflected. If you try to treat laryngeal tuberculosis with X-Rays you can not get the rays down on the structure, and since the X-Rays which are given off from the negative pole against the concave surface of the tube do not reach the structure that is diseased, we can not expect results in these cases. It is well known that all the rays we are using have a great bacteriocidal power, far more than any other agents we can use without destroying the tissues, and if it were possible to use the X-Ray apparatus in the larynx you would see results. Radium has a positive bacteriocidal property, and in my paper I will tell of a case of tubercular larynx where the radium tube is applied directly to the site of the lesion. So far as the bacteriocidal effect of formaldehyd is concerned, I have carried on experiments in otitis media and have found that formaldehyd is a bactericide.

GEORGE W. SPOHN (Elkhart, Ind.). I desire to say something about the formaldehyd treatment, as I have used it with excellent results. It has been intimated that none are cured except here in Colorado. I believe some of the cases are cured in this climate; but when the disease has not progressed very far, in the eastern states it frequently can be arrested, and the treatment given by Dr. Lockard is a splendid treatment and is far superior to nitric acid. It seems to me the prognosis depends very much upon deglutation. If we can feed our patients we can get them well. It depends upon the amount of food they can get and assimilate. I have given these patients a very weak solution of cocaine. One-half per cent, sprayed in the larynx fifteen minutes before each meal will cause it to relax, and will not hurt them. In fact, I tell them to swallow the cocaine. When there is relaxation of the pharyngeal muscles, the patients can eat a good meal and enjoy it. I have never seen a case that acquired the cocaine habit from this use of it.

On the other hand, by improving their nutrition by forced feeding, and using the formalin sprays, the patient will show improvement in ten days or two weeks unless the disease has progressed to the point where there is no relief.

Dr. OTTO J. STEIN (closing). In reply to Dr. Loeb's remark regarding the pathological findings, I will say that I have one detailed

report showing the round cells and tubercular bacilli, which was conclusive in my mind and the minds of those who saw the specimens. The other case was reported by the pathologist simply as tubercular tissue, without any further details.

I would like to add a remark as to the medical treatment of this disease with formalin. I have used it in a few cases recently with what, apparently, are astonishing results. I was more than pleased with the relief afforded, and I have every hope in the world that possibly we have in this remedy one that will prove of greater value than we really realize now.

Dr. L. B. LOCKARD (closing). I think no one will deny that the climate does play an important role, but it is certainly not the chief element in the cure of laryngeal lesions. Without treatment the disease will develop and progress as it does elsewhere, while the institution of local treatment will usually cause prompt improvement. That retrogression almost invariably follows a too early discontinuance of treatment, is sufficient proof that the effect of the climate if only an indirect one, and that it does not play the important part that has been credited it in the discussion. I have not intended to say that formalin is a specific or cure-all; it is simply better than anything else, and I do not claim its chief action is a germicidal one. If it had no antiseptic action whatever, I think it would still be the best remedy we have. There is no question that if there is an ulceration, the germicidal action, no matter how slight, does good. Of course a perfect laryngeal germicide is out of the question. In regard to the X-Ray I think we get too much instead of insufficient reaction. Three of my cases which were favorable, developed dysphagia after a few weeks and we could not pursue it. I never saw the slightest result in a curative way, but probably all showed aggravation of the inflammatory conditions. I have been asked the strength of the formalin. As used in the spray at home it is from one to three drops to the ounce, and applications of three to ten per cent.

Dr. ROBERT LEVY (closing). I have attempted, in speaking of prognosis, on other occasions as well as this, to establish a middle ground. I think we must be very careful not to become too enthusiastic either as to its hopelessness or hopefulness. If we can study these cases as we do others, arriving at a fair conclusion, I think we can accomplish all that can be expected. I would warn against too much optimism, but at the same time, I believe we must fight the general feeling that exists among a great many general practitioners and the impression that has gone out up to the present time that these cases are hopeless. I want to establish a middle, fair, rational position.

SOME EXPERIENCES WITH ADRENALIN CHLORIDE.

BY D. EMMETT WELSH, M.D., GRAND RAPIDS, MICH.

Case I. I was consulted Feb., 1904, by J. B., aged 19, on account of a growth on the ear. The boy in appearance was robust and healthy and gave a good family history. The growth was located on the lobe of the left ear, filling the concha, partially occluding and extending into the external auditory meatus. It was nodulated in form, very hard on pressure, though not painful, and vascular. A section was taken and the microscopic findings proved it to be a myxo fibroma and an early operation advised. The patient was taken to Butterworth Hospital and prepared for operation.

The urine by analysis was normal, the lungs normal and the heart in sounds, size and position normal. The patient in appearance was strong and robust and physical development perfect.

Chloroform was the anæsthetic used. During its administration there was no evidence of excitement or impairment of respiration. The anæsthetic was taken easily and administered slowly. When narcosis was produced I injected into the growth thirty minims of a solution of chloride of adrenalin. To-wit: Chloride adrenalin dram 4, sterile water dram 4.

The growth was so dense and hard that my needle bent and it was with difficulty that I could force the fluid into the tumor. The attempts were made at different points of the tumor and three were made before I used the above quantity.

During this time the anæsthetic was being given and the patient was looked after by the anæsthetist. After injecting the tumor I turned from my patient, laid the hypodermic on the instrument stand and on returning to my patient I noted the tumor was blanched, a bluish discoloration on the cheek, the lips cyanosed, the pulse could not be found, respiration had ceased—my patient was dead. In this short space of time probably one half minute to a minute had elapsed in turning from and to my patient. No symptom was noticed by the anæsthetist.

The conditions noted came so suddenly that the respiration and heart action seemed to cease simultaneously. All forms of resuscitation were resorted to but without avail. I did not conduct an autopsy, but I was informed by those who did hold one that they

could not find any lesions. I contented myself that death was due to the chloroform and would so continue to believe had not a second case presented itself and alarming symptoms occurred without the fatal results.

Case II. Katie C., aged 18, presented herself for examination on account of a marked exophthalmic condition of the left eye. The examination showed it to be and the microscopic findings proved it to be a sarcoma—round cell variety.

An exenteration of the orbit being always very bloody I concluded to use the chloride of adrenalin. Chloroform was the anæsthetic used. I injected sixty minims of an equal part solution of chloride of adrenalin and sterile water into the orbital tissue. I then enucleated the eyeball with a small loss of blood. Wishing to control the hemorrhage still more, I saturated a pledget of cotton in the above solution and pressed it into the orbit. Probably one half to one minute thereafter, respiration ceased, the patient became pulseless, the lips slightly cyanosed and a bluish spot showed on the cheek similar in appearance to the former case.

The patient's head was lowered and a cold towel made to strike over the præcordia, artificial respiration instituted. Fortunately in a short time my patient revived and I finished the operation, which was comparatively bloodless.

This patient took the anæsthetic very well without excitement or disturbed respiration.

I cannot tell whether the solution of chloride of adrenalin was made by P. D. & Co., or Armour & Co. The question arising in the first case might be dispelled by the chloroform alone, but the second case following so closely and under conditions somewhat similar, make it an important factor.

I am unable to find any literature on the subject of chloride of adrenalin and its truly beneficial results except from the manufacturers, but this experience has made me cautious as to its indiscriminate use as to strength and quantity.

In these cases respiration and heart beat seemed to cease simultaneously. From its reported heart stimulating effect one would infer there was no danger from its use and particularly in anæsthesia and I have noted its recommendation as a stimulant in the depression of chloroform and ether.

I have been informed by P. D. & Co., that 1 minim of the solution of 1 to 1000 is equivalent practically to one-half grain of the fresh suprarenal gland. As we must take it for granted this being entirely correct, in my first case 30 minims being used there was contained

in this hypodermic medication seven and one-half grains of fresh suprarenal gland; while in the second case fifteen grains were used with an additional amount absorbed from the pledget of cotton packed into the orbit, and of that I cannot judge. Prior to this experience I have used it full strength, locally and hypodermically, but since then I am using it in one drachm to the ounce and with good and no unpleasant results.

DISCUSSION.

Dr. S. H. LARGE (Cleveland, O.). I would like to call attention to the experiments of Dr. Crile, of Cleveland, who has made an exhaustive study of the action of adrenalin chloride. He proved that the solution injected intravenously was fatal in large doses. They are using it now in surgical shock. You can inject the solution subcutaneously it must be watched very carefully and the dose etaoin cutaneously without serious results, but when used intravenously it must be watched very carefully and the dose must be comparatively small.

Dr. JOS. C. BECK. I am much interested in this paper, because I have had some experience with adrenalin in operating on the mastoid. Permit me to report briefly the case, one of marked necrosis of the mastoid in a colored man 23 years old, with a complication of facial paralysis. A diagnosis had been made that tuberculosis existed in the lungs, and I accepted the diagnosis that this was a tubercular condition. The usual procedures before operation were taken and the heart, etc., found normal. No uneasiness was felt in regard to giving the patient chloroform, previously using gas. I had just gotten into a very rotten mastoid, when the doctor said the pulse was at least 200. Knowing Dr. Crile's demonstration of using adrenalin and pressure on the body to overcome shock and such conditions, I gave orders to inject adrenalin subcutaneously, and the pulse went down to 120, and remained down sufficiently for me to finish the operation. I had occasion to use it again in a similar but not so alarming condition as that, and I am satisfied with the report of Crile, particularly when associated with anæsthesia.

Dr. A. H. ANDREWS (Chicago). We will frequently have cases of general anæsthesia going wrong. We find them in cases similar to those reported by Dr. Welsh, in which no adrenalin chloride had been used, and it is possible for a series of cases to occur together. It strikes me as possible that Dr. Welsh's cases are purely due to the anæsthetic and that the adrenalin had nothing to do with the symptoms. I would like to know whether any of the members present

have had such experience after using adrenalin, either by local application or by injection, when a general anæsthetic had not been given.

Dr. A. C. FRIEDMANN (Colorado Springs, Colo.). I call attention to a case reported of the use of adrenalin at the same time as atropin. It was in the "German Weekly for Therapy and Hygiene of the Eye" and the patient experienced an attack of atropia poisoning with all its symptoms while when formerly (without adrenalin) under a mydriatic never anything of the kind happened. The writer accused the adrenalin of facilitating the passing of the atropia through the lacrymal duct and into nose and throat. In a reply I advised to use always atropia first and after a short interval the adrenalin. I have always done so and never observed any ill effects of either drug.

Dr. H. L. BURRELL (Omaha, Neb.). I had a little experience with adrenalin chloride which it might be well to relate at this time. Having occasion to operate on a deflected septum, I packed the nose with a 1-5000 solution in cotton and then used cocaine for anæsthesia. After finishing the operation, which was beautifully bloodless, the patient complained of feeling very weak. I laid him on the table and found his pulse to be only thirty-eight. It was nearly two hours before it reached sixty beats per minute. I have given ten drop doses three times a day of a 1-1000 solution for tinnitus aurium without systemic symptoms.

Dr. W. T. GROVE (Eureka, Kan.). I used a drachm of adrenalin chloride in two children, aged 4 and 6 years respectively, for double tonsillotomy and did not have any bad effects whatever. I used it locally with a swab. The patients were under observation two hours after operation with apparently no hemorrhage. I used the cold snare on one side and tonsillotome on the other.

Dr. DUDLEY S. REYNOLDS. I have had considerable experience with this in nasal surgery and in operations on the tonsils and in mastoid operations. I take a cotton mop and mop it freely on the pharynx, and push it into the cripts of the tonsil and behind the uvula, and spray it into the nose before an operation of any sort. I put it in the spaces between the turbinal bone and use it freely every day, and the patients swallow it even, and I have yet to see any bad effect and I think it is a fallacy to suppose that it predisposes any one to hemorrhage. I think there is less tendency to hemorrhage than where it is not used, and I am sure there is no increase of a predisposition to toxicity to be reasonably feared from its use.

Dr. A. ALT. I want to say that not all hemorrhages are arrested by adrenalin. I happen to know of a case of fatal hemorrhage from the conjunctiva in a new born child after the application of nitrate of silver to prevent infection, in which the adrenalin, even when powdered on the oozing surface, failed utterly in stopping the hemorrhage. In fact, in my experience adrenalin is a good remedy in order to prevent the local hemorrhage which would follow an operation, but not a good hæmostatic after bleeding has been established.

Dr. D. T. VAIL. In the case Dr. Alt has reported, I agree with him that the explanation of the inefficacy of adrenalin lies in the fact that its application to a mucous membrane which is leaking is useless. I have attempted to stop nasal bleeding by putting it into the nose, and it is inert. The only time you can rely on it is before the abrasion is made.

Dr. MORRILL. I have had a little experience with adrenalin chloride. I had occasion to operate on a deflected septum, and had cotton saturated with 1-5000 and used cocaine also for an anæsthetic, and went on with my operation, and it was beautifully bloodless, and just about the time I got through with the operation the patient complained of being very faint, and I laid him down on the table. His pulse was 38. I watched him for an hour, and it was fully two hours I think before his heart reached 60 beats per minute. I have given it internally, ten drops three times a day for tinnitus aurium without systemic symptoms whatever.

Dr. J. C. BUCKWALTER (St. Louis). I use adrenalin always in operating in the nose, on the eye or lids, injecting in the lids frequently ten drops, and I have never seen any untoward effects. For nasal operations I prescribe 2 drachms of adrenalin and direct the patient to take from 5 to 10 drops every hour or two, according to the age and according to the amount of hemorrhage, if they have hemorrhage when they go home, or before they go home. Frequently patients have taken a drachm in the course of 12 to 16 hours without any bad effects whatever.

EXPERIMENTS WITH RADIUM IN SOME NOSE, THROAT AND EAR DISEASES.

BY JOSEPH C. BECK, M.D., CHICAGO, ILL.

Ever since the wonderful discovery of the X-Ray by Roentgen, and shortly after by the scientific evolution of the same by Tesla, Edison and others, considerable interest has been awakened in the scientific, particularly the medical, world in photo and radio-therapy. X-rays, Finsen rays, Minin light, sun rays, high frequency current and radium rays have had their therapeutic application sufficiently tested that one can make a fair comparison as to their value. Like all new discoveries, the various rays have been taken up with considerable enthusiasm, and consequently a large amount of literature is already at hand, with controversies as to the successes and failures. Some of the literature and report had better not have been published for the good of the ray treatment, as the reports of some men are either from poor observation or not entirely honest.

From my collection of authenticated cases reported, I should place the various rays in the following category as to their therapeutic value: First, X-Ray; second, Finsen light; third, Minin light; fourth, high frequency; fifth, radium; sixth, sunlight.

This classification may not be entirely correct, particularly so far as the radium is concerned, because its radio-active property is shown to be far superior to any of the other rays, but from the practical or clinical standpoint up to the present time it has not found a place near the top. It is an established fact that the radium rays mentioned cannot be deflected or broken in any way except by a magnet, but that they travel in straight lines; also a clinical fact that the best action of radium rays is obtained if they can come directly in contact or as nearly so as possible with the pathological tissues. This fact places radium as the most practical radio-active substance for treatment of pathological conditions in cavities as, for instance, the ear, nose and throat, which are not so easily accessible with other ray apparatus, such as the X-Ray tube, Finsen or Minin lamp.

About the same time that Roentgen made his discovery known, physicist H. Becquerel reported that uranium had the same properties of radiation as the X-Ray, but spontaneously, that is, without the aid of an electric current.

This discovery gave an impetus to the scientists, and they proceeded to find substances that contained uranium in greatest quantity. They found that the pitch blend, particularly that found in Joachimstahl, Bohemia, was the richest in containing radio-active substance. Professor and Madame Curie, of France, and at the same time, independent of them, Prof. Giesel, of Germany, obtained a large quantity of this pitch blend, and produced from it a substance highly radio-active. This in honor of the birthplace of Madame Curie was named Polonium. This substance was soon discovered not to be absolutely pure, so the Curies experimented further until they obtained the real article, which they called radium. Radium belongs to the Barium group, and its rays are about two million times as intense as the rays of uranium, or Thorium. Radium as used in medicine is in the form of a salt, either bromide or chloride, and is a white, fine powder contained in hermetically sealed tubes of either glass, rubber, aluminum, celluloid, or mica. The action of the radium is by, first, its *rays*; second, by its *emanations*, and it has the property of luminescence and giving off heat. Three distinct rays are described as given off from radium with three distinct activities, called *Alpha*, *Beta*, and *Gamma* rays. The Alpha rays or first group of radiation carry a charge of positive electricity and appear to be electrons. They constitute the majority of the rays, that is, about 90%, but have a very slight penetrating power, not even passing through the tube wherein the radium is contained. The Beta rays, or second group of radiation, are negatively charged with electricity, are much smaller in number, but have a much greater penetrating power. They seem to be analogous to the rays given off from the cathodal end of a Crook's tube when acted upon by a proper electric current.

The Gamma, or third group of radiation, are present in a very small proportion compared to the other two, but have a high degree of penetration. They are also charged with negative electricity. They are analogous to the X-Ray. The radio-activity of radium is due to the combined action of the three groups of radiation. The Alpha and Beta rays are material particles, while the Gamma rays are simply undulations. The *emanation* of radium as described by Rutherford is a luminous gas constantly given off and easily taken up by other substances which it comes in contact with, and become radio-active. However, this radio-activity is not permanent. These emanations are not given off through the glass, rubber, celluloid, etc., tube, only when the radium is not hermetically sealed. This fact disproves the claims made by some experimenters as being able to make radio-active fluid by simply immersing the sealed tube of radium into distilled water. Rutherford and Suddly have shown

that thorium gave off emanations quite as active as those given off from radium, and certainly much easier obtained, because thorium is more plentiful and cheaper. Hugo Lieber has been successful in obtaining these thorium emanations in quantities and placed in proper apparatus to make them useful in practice of medicine, particularly in treatment of tuberculosis of the lung.

The luminescence can be demonstrated in pure radium very easily in the dark room. The salts of radium, however, have a very limited luminescence, and it is claimed that this luminescence is due to the action of the rays on some of the impurities, for instance, barium. The heat given off from radium is said by Curie to be equivalent to melt its own weight of ice in one hour.

THE PROOF OF RADIUM.

In order to prove that we have radium or its salts, and not other radio-active and inferior substances, we must resort to one or more tests. First, the electroscope, which will show in a few moments the activity of the substance as to its radiation in the manner it discharges the electroscope. Second, by the use of a photographic plate, exposing it to the rays of radium and using a flat key or any other small convenient substance to photograph, and in developing this plate will show the radio-activity of the radium. Third, the absolute proof of radium is by the use of an electrometer.

EXPERIMENTS.

A very interesting experiment was carried out by Prof. Danysz, of the Pasteur Institute, Paris. Twelve larvæ were exposed to the action of radium for one-half an hour, another twelve were kept as controllers and not exposed. After two weeks, mostly all of the twelve exposed were dead, and those remaining alive remained in the larval stage; while the unexposed twelve had already developed into perfect butterflies. Six weeks later one larva of the exposed lot was still alive, while the lot not exposed had multiplied to the fifth generation. This experiment would indicate that exposure of embryonic bodies to the radium tends to retard their development, or can destroy their life.

Experiments as to the action of radium on bacteria have been carried on by Aschkinass and Caspari, Harry Crooks, Pfeiffer, and Frieberger, with almost universal positive results, such as retarding the growth or destroying such bacteria as the typhoid, cholera, and others.

Pusey gives a very clear résumé of the various experiments that were made as to the effect of radium on the living tissues, as, for instance, M. Bacquerel and M. Curie both developed burns on their bodies from carrying radium in their vest pocket without first protecting same by a lead body. These burns took two or three months to heal, and in the case of Hallopeau it took nearly six. According to Scholtz, it takes twenty-four to forty-eight hours for a radium burn to appear, but other observers, as Halkin, found it to be much later. When the radium is brought before the closed eye, it illuminates the same. Javal and London have experimented with the blind, and found no reaction as to perception of light wherever the eye was entirely blind, but in cases where the least perception was still present, the person would perceive a bright light.

Experiments on the nervous system with radium have proven that mice, particularly young mice, were either paralyzed or killed when exposed to radium for any length of time, and such symptoms as convulsions, coma, cachexia, have been quite common in these experiments.

Microscopical examination of tissue shows distinct changes. Guinea pigs and young pigs were used for these experiments, and the skin examined showed on the third day a change in the capillaries of the corium in that they were increased, and a few days later marked inflammatory changes could be easily demonstrated; later degenerative processes developed, which became absorbed. *Halkin* made the above experiments, and *Scholtz* made similar experiments with the X-Ray, and both authors agree that the microscopic changes in both cases are very similar. The radium rays will affect the normal tissue the same as they do pathological, only the resistance of the pathological tissues, as, for instance, the cancer cell, the cells of lupus or tuberculosis, the vegetable organism, is less than the cells of the normal structure, and they, that is, the pathological tissues, break down easier.

CLINICAL OBSERVATION.

When we consider the short time that radium has been added to our therapeutic armamentarium, and, on the other hand, look over the literature, foreign as well as American, we feel proud of the medical workers. Scarcely a number of any journal appears which does not contain an article or a report of cases of radium or wherein it has been employed, and most of them are extremely encouraging in their results. I would like to state that this fact has discouraged me somewhat, and if it was not for the fact that some other men have

had similar results as I have had in not succeeding in every case, I should not perhaps be reading this paper today, and feel that there must be something radically wrong with either my diagnosis, my radium, or my technique.

The technique is so simple that I could not have made a mistake, since all it requires is to place the capsule or tube containing the radium on the part that we wish it to act upon, and allow it to remain from five minutes to half an hour, as one knows from reading or experience.

So far as the radium being of the proper kind is concerned, I had same tested by the electroscope as well as by the photographic plate, and it was found to be as represented, that it, fifty milligrams of radium of the 10,000 radio-activity, manufactured by Curies, of France.

As to the diagnosis, I will say that in most instances the cases were very clear, and in the majority of them microscopic examination was usually made before treatment was instituted.

The various conditions in which radium has been employed are principally skin lesions or pathological conditions on the surface of the body, since it is the better ray that is of greatest value in the radium, and that has only a penetrating power skin deep, as proven by the experiments of Halkin. The Gamma rays that have a much greater penetrating power are too few to be of any great value in the quantity of radium used.

In collecting the cases I have found the following conditions reported as treated with radium with more or less success: Acne, eczema, psoriasis, lupus, keloid, telangiectasis, epithelioma, carcinoma, sarcoma, rodent ulcer, chancroid, laryngeal tuberculosis, pulmonary tuberculosis, treated by inhalations of gases obtained from aqueous solutions of radium and thorium emanations, cyclitis and irido-cyclitis, convulsions, affection of the trigemina, and some other conditions not mentioned above which I treated and will report in detail.

I said most cases are reported with more or less success, and usually more than less. I can do no better than to repeat the remark made by Dr. Henry G. Piffard, of New York, who says in connection with these premature reports: "History has shown that wherever a new powerful therapeutic agent has been introduced, the earlier reports of its use are extremely favorable, especially from those who appear to be anxious to have their names connected with it, as being among the first to use it. More conservative observers reserve their opinions until they have accumulated a wider experience,

and have learned not only the advantages but also the limitations of its therapeutic action."

While I feel somewhat guilty as to belonging to the category of Dr. Piffard's accused, in the reporting on the use of radium after only about six months' time, I want to acknowledge the fact that my reports are not very favorable, and should serve the purpose of stimulating others to work in this line, as I have promised to do myself, in order that we may come to the proper conclusions as to the therapeutic value of radium, particularly in the application in ear, nose and throat affections.

CORRESPONDENCE WITH PHYSICIANS.

I have attempted as much as possible to speak personally to physicians whom I knew had used radium in order to get their opinions, and where this was impossible, sent out the following five questions as to their experience with radium:

1. In how many cases have you used radium?
2. What were the pathological conditions?
3. What were the results?
4. Any complications, such as burns, etc.?
5. What strength of radium do you use, and have you had it proven?

I will not report in detail each answer, but generally. First, the number of cases treated were usually not stated definitely; usually less in number than what I had expected. Second, most cases that were treated were skin lesions or superficially located malignant disease. Third, the results promising and flattering. Fourth, no complications, as burns, etc. Fifth, most of them used a lower radioactive radium, and did not have it tested.

My experience with radium dates from Feb. 1, 1904, that is, just as soon as I was able to obtain it, and I have applied it very diligently and kept strict record of the cases up to date. I have found a great deal of difficulty in being able to keep the patients long enough under treatment to make proper observations. Clinical patients were the most unsatisfactory, because they were usually in need of treatment, and the placing of a small capsule into the ear, nose or throat appeared to them not efficacious enough, although such a placebo as an innocent spray was often added to the treatment, in order to make them stick, consequently a large amount of my work came to naught, but I shall not report these cases. Most of the cases that I have been able to follow were private patients, although it became necessary in some of the cases to explain in detail that the treatment

was somewhat of an experiment, and took longer to show results. This last remark shows you one of the greatest disadvantages that I have found in the use of radium in that it acted very slowly in some of the cases. Before I commenced to treat cases with radium, I proceeded to look up the literature as to the method of application of the radium, particularly in affections of the ear, nose and throat, but failed to find any, so had to work entirely independently and on my own judgment. I selected for my experiments such cases that I thought may be influenced by the action of the radium ray, and particularly the worst kind of cases, such that have been treated by other methods and failed, or conditions that I knew if other methods had been used, poor or no results would have followed.

REPORT OF CASES.

Case I. Mrs. M., aged 30, two children. Had always been fairly well. Family history shows sister died of tuberculosis. Venereal history negative. Two years ago noticed considerable trouble in breathing through her nose; complained of frontal headache and generally not feeling well.

Shortly after her left ear commenced to discharge, which continued to do so. I saw the patient about one and a half years ago, and diagnosed the condition as a chronic atrophic rhinitis, with a chronic suppurative otitis media. Treated the condition in the usual manner. The patient did not get better; in fact, the ear began to hurt her, and granulations were becoming more pronounced. I proposed a radical operation, for the cure of the suppuration of her left ear, to which she consented. The Stacke-Schwartz plastic operation was done; the result—the ear became dry, and remains so. About six months ago the patient returned to me with a great deal of difficulty in nasal breathing, particularly on the left side. Examination showed a soft granulating mass on the anterior portion of the septum, which bled very easily, on touch, about the size of a small hazelnut. Marked pain in the front part of the head. I removed a small piece of this mass for microscopic examination, and it was examined at the Columbus Medical Laboratories, by Prof. Evans, who reported to me it to be tubercular. So far as the examination of her lungs or any other part of the body is concerned, it is negative, particularly as to tuberculosis, and consequently I made the diagnosis of a primary tuberculosis of the septum.

Treatment. Thirty-three applications of radium bromide from five minutes to a half an hour, at each side of the nose, as close to

the pathological growth as possible, at intervals at first every day, and later three times a week, and finally once a week.

Observations. The headaches and pains disappeared almost after the second treatment. After about six treatments the mass looked better, and did not bleed as easily on touch. After twelve treatments the patient was able to breathe better, but far from free, and from this time on until three weeks ago, which terminated the thirty-third treatment, and the last, the improvement as to diminution in size of the growth has not been perceptible. The appearance of the mass was improved. It appeared harder, and looked as though the mucous membrane was going to cover it. In order to test the efficacy or superiority of the X-Rays to those of the radium, I treated the patient by means of a soft tube, four inches from the nose, for five minutes, using a current of 87 volts, and one and two-tenths amperes at the first sitting. Three days later no appreciable difference in the condition of the mass, and the second treatment, the same as the first, given. Three days later no appreciable difference, and the same treatment, with the exception of using a smaller voltage, say 70, and a greater amperage, say 2. Five more treatments have been given about the same strength, with absolutely no change in the condition of the mass.

Case II. Mrs. T., aged 39, contracted lues in 1901. Notwithstanding most thorough antisyphilitic treatment, she developed tertiary symptoms of the worst kind, particularly in the nasal cavity. About three months ago she presented herself to me, and I found the entire septum, except a small portion of the anterior cartilaginous part, destroyed. All the turbinated bodies, as well as a portion of the right lateral wall of the nose, the lower wall of the sphenoidal sinus, was absent, and the whole surface in a marked ulcerated granulating wound with a very foul odor. The patient came for the relief of the pains she had within the nose and head, and for relief from the odor, which was so objectionable to the family and other people she came in contact with. The masses of crusts, perfect casts, would frequently drop into the post nasal space and be swallowed by the patient. The usual treatments for cleansing and healing, as well as deodorizing, were applied, such as menthoxol, followed by copious douching with antiseptics; nitrate of silver, cauterizing the surfaces, etc., but with little relief. The usual anodynes were used in order to relieve the pain, which they did but partially.

Treatment. By means of radium applications intranasally, allowing the tube to remain on the various portions of the ulcerated nasal cavity for a period of twenty minutes every day. After three treat-

ments the odor was markedly diminished, and the pain very much less in degree. I discontinued all the other methods of treatment except the mechanical removal by means of forceps of the crusts. There was no need of any internal treatment (anti-specific), because the urine examination showed free iodine. She had received large amounts of iodopin injections for a period of eleven weeks. These treatments by means of radium were carried out as said above for a period of two weeks, when the surfaces of the nasal cavity were in fairly good condition and healing, and the pain almost entirely disappeared. Lest I be misunderstood by the report of this case, I am not claiming an antisyphilitic remedy for the radium, but purely local. I have had several other such cases under treatment, but did not observe them long enough to make absolutely satisfactory reports; suffice it to say, however, that during the brief time I did treat them and observe them, the odor was markedly diminished, without the use of any other method of treatment.

Conclusions in this case would be the relief of pain and the destruction of the odor, by means of radium. The latter condition might be due to the bactericidal action of the radium, particularly on the saprophytic variety.

Case III. Miss R., aged 16, referred to me by Dr. Wm. Ballenger for radium treatment. There is a very extensive history of this case, which I will abbreviate as much as possible. The patient had been suffering from nasal occlusion for several months when Dr. B. first saw her, in 1903. She said that the obstruction was getting rapidly worse of late. Examination at that time showed all the turbinated bodies of both sides enlarged, and would not shrink by the use of cocaine, adrenalin, or cautery. Dr. Ballenger removed portions of the turbinated bodies, and the patient obtained some relief. Microscopic examination was made by the College Pathologist of P. and S., and found to be either tubercular or sarcomatous. The small amount of relief that followed the operation was of short duration, and after a few weeks a greater amount of obstruction was present, with the additional pain across the nose, and a perceptible swelling or broadening of the bridge of the nose. Dr. B. decided to do a second operation, and under general anæsthesia removed the turbinated structures as completely as possible. The relief from the second operation was more marked, and lasted longer. Microscopic examinations of the tissue removed the second time were made by Prof. Evans, Columbus Laboratory, as well as by the College Pathologist, who found the tissues to be of sarcomatous nature. After about two months the patient returned with the same amount of

nasal obstruction, considerable pain across the nose, with a perceptible widening of the same. In lieu of these facts, and the microscopical examination, Dr. B. decided to do a radical operation in the following manner :

Making an inverted U-shaped incision from one nasal process of the superior maxillary bone to the other, across the highest portion of the nose, then with a Gigli saw through the bony structures, and finally a third incision through the mucous membrane, turning the nose downward in that manner, exposing the whole nasal cavity. He removed all that he thought required removal or appeared to be sarcomatous. Although patient was very ill after the operation, for about a week or ten days, acting like a very septicemic individual, with the exception of a slight dacryocystitis, the wound healed by primary intention, and patient could and still can at this time breathe perfectly freely through her nostrils. The reason Dr. Ballenger referred the case to me was to prevent recurrence, if possible, and to relieve the patient of extreme pain in her nose and head, which would not respond to the ordinary anodynes. In consequence of these pains, patient was unable to sleep.

I applied the radium tube for ten minutes into the nasal cavities daily for four days, during which time the patient did not notice any improvement as to the relief of pain, but said that she commenced to sleep a little better, and that always right after treatment she felt very drowsy. After the fifth day of the treatment she reported some relief from pain. On the sixth day a positive relief from the same. From that day on for the next thirty days I kept strict record, and found that after the twelfth treatment she went a whole day without pain. I discontinued treatment for one day, when her pain was increased. I again reapplied the radium, and she was again relieved, this time for two days. Reapplied the radium for twenty minutes, and she was without pain for four days. When she returned at this time complaining of pain, I introduced a capsule that looked exactly like the one containing radium, only that its contents was made up of prepared chalk, and I introduced it into the nose for ten minutes. I instructed her to return the next day, and she voluntarily told me that she did not feel sleepy right after the treatment, as she always did after the other treatment, and was not relieved of her pain. I then introduced the radium again, and she was relieved for the next three days. Ever since that time I have found the radium to act positively, as an analgesic in this case, and that it would act much quicker and for a longer time, the longer time we used it. She was absolutely free for three weeks of pain without any treatment, when

she returned complaining of some slight pain, and the reapplication of radium for one treatment relieved her for a week.

At the last examination of her nose I found that the left side was getting somewhat occluded; perhaps with the malignant growth. However, the general condition of the patient is fairly good, and there were no evidences of secondary infection or metastasis.

Conclusions in this case are that the radium has acted as a positive remedy to relieve pain and to produce sleep, saying nothing of the possibility of the prevention of recurrence of the malignant growth

Case IV. Mrs. W., aged 32, referred to me by Dr. Ballenger for the radium treatment, on account of pain in her nose. The history of the case is as follows: Dr. B. removed a ridge from the right side of the anterior portion of the septum for the relief of ear trouble. I presume O. M. C. Chr. Examination showed there was nothing unusual in the operation or healing of the wound. Patient complained constantly of having pain in the nose and ordinary methods that the doctor employed refused to relieve her. My diagnosis was either a neuralgia or hysteria, and Dr. B. concurred with me in my opinion. After the third application of radium for a period of five minutes to the seat of pain, the patient was relieved and after the fifth treatment she declared that she had no more pain. I discharged her, and asked her to return if she had pain again, but up to this day she has not returned.

I intended to test this case by putting in the tube containing prepared chalk, but had no opportunity, in order to prove the patient was only imagining the relief, or had really no pain.

Case V. Mr. B., aged 39, referred to me by Dr. Carl Beck for radium treatment, with the following history and findings. Patient complained of a sore nose and upper lip on his right side for the past four months. He had been under treatment by other physicians, who diagnosed the condition as syphilitic, and prescribed the usual anti-specific remedies, but the patient being of the more enlightened variety declared that he had never a primary sore, and no other symptoms, refused to use such remedial agents. When he presented himself to Dr. Beck the examination showed a small ulcerated area on the right ala of the nose, near the floor, and involving portions of the upper lip. In each hair follicle one could see a small amount of pus, and on epilating the same it showed disease. He made a diagnosis of sycosis, and treated him by the usual method, as epilation and salve treatment locally, and cauterizing the ala of the nose. The healing was very slow or not at all, and so when referred to me, I

applied the radium directly in contact with the ulcerative surface for a period of ten minutes for five treatments, but because the condition was not markedly improved in that time, the patient asked the doctor to please do something else, for, as he expressed it, he could not see how a little bulb filled with a little powder, which he couldn't even feel, could do him any good. Dr. Beck therefore used the negative pole of a blunt end electrode needle, made a few applications into the diseased hair follicles, and the patient said he noticed condition was healing. After three such treatments the patient discontinued treatment, and declared he was well. About two months after this occurred I saw patient and found that the condition was entirely healed.

Conclusions. Conclusions in this case would be that the improvements following the use of radium are late, and I would appeal for the support that radium ray cured him, because we know the use of electrolysis or anything else in sycosis has always been very slow and unsatisfactory, and not permanent. However, another case will tell us in the future more about it, when we will be able to persuade the patient to have only radium applied, and no other treatment.

Case VI. Mr. T., aged 26. This man had for two years a dark brown mass on the top of his tongue, resembling long hairs, which caused him a great deal of annoyance in attempt to clear his mouth, and when taking on the recumbent position would cause him to constantly cough. He made several attempts himself to remove it by sharp spoon, and succeeded, but the condition would inevitably return, and like a strong beard, much stronger. I saw him about a year ago, and made a diagnosis of lingua negra, or a black tongue. I presented this case to the Chicago Laryngological Society, and published same in the Illinois Medical Journal, 1904. Dr. Lieberthal, who has seen several of these cases, commented on the difficulty in curing this condition, and advised the use of X-Rays, not knowing of or referring to the radium treatment at the time. Shortly after this I applied the radium on top of the tongue for several sittings, one week apart, lasting ten or twenty minutes. After several treatments we could remove these masses easily, and after the seventh treatment the tongue was clean and has remained so until the present day.

After the fourth treatment, patient came back the next day and complained of a soreness on the roof of his mouth. I found a large red surface over the anterior portion of the hard palate that I thought might have been a burn, but since it appeared so soon after the application, and getting well inside of twenty-four hours by the simple use of a mouth wash, I believe that it was purely coincidental.

Case VII. Miss L., 21 years old, always been well. Mother died of some lung trouble. About five months ago she developed a sore throat, pain on swallowing, and her speech became muffled and hoarse. These pains soon increased, and radiated toward the right ear. There was a cough, and expectoration of muco-pus; amenorrhea for a year; poor appetite; had been losing flesh of late; gets hot flushes, particularly in the afternoon, and night sweats. Examination: Temperature, at 10 a. m., 99° ; in the evening, 100.6° . Pulse, 85 to 95. Pain on pressure over the thyroid cartilage, particularly on the right side. Some glands in the neck on the same side. Nose is free; also pharynx and ears. The larynx showed a swelling on the right vocal cord in the region of the right arytenoid. However, no ulceration. Microscopic examination of sputum shows tubercle bacilli in large amounts. Bright side of her lung, the apex is dull; some moist rales, and bronchial breathing. Diagnosis, tubercular laryngitis. Secondary.

The treatment consisted in the application of radium three times a week for half an hour each sitting. Some relief from pain. But the pain was so marked that I was tempted in justification of this fact to do something else. But even if censured, let me report the fact that I continued the application of radium for four more treatments, which was the limit of endurance of the patient, as well as myself, and I substituted the local application of lactic acid, which relieved the patient almost after the first treatment, so that I could use the radium in conjunction with other local treatment. The relief of pain was certainly more marked than when simple local treatment was used; at the same time, I wish to acknowledge the imperfect report of this case.

The last time I saw the patient, and obtained the expectoration, examined microscopically, and found it to contain just as many tubercle bacilli as before.

Case VIII. Mr. F., 57 years old. Referred to me by Dr. Hall. Diagnosis: Carcinoma of the larynx, with glandular involvement. Complains of terrific pains in swallowing as well as speaking. Cannot sleep. Usual method of treatment refused to relieve him, except high doses of opiates. Discontinuing these, and applying radium every day for half an hour, relieved the patient somewhat, and made him sleep. This one treatment encouraged me very much, and I volunteered to apply the treatment twice a day for the next three days, but it was necessary to give patient some opiates in order to relieve him of pain. Notwithstanding this fact, I continued to apply the radium for a week each day for a period of half an hour, in con-

junction with small doses of opiates, and I observed that the relief of pain was greater than when the opiates were used in large doses without the radium. After seven weeks of these maneuvers, I was notified that the patient had a violent hemorrhage, which exsanguinated him to such a degree as to prove fatal within two or three days.

Case IX. Mrs. L., aged 51 years. A markedly anemic woman; has had arthritis deformans for many years; came to me complaining of severe head noises and noises in her ears. Distinctly separated the two. The head noises were unbearable. Associated with this there was considerable amount of deafness. Diagnosis: Chronic catarrhal condition of the middle ear, of the dry sclerotic variety, with considerable involvement of the labyrinth. The hearing test by voice showed patient could only hear loud voice on contact. A C₂ 512 tuning fork is not heard by air conduction, and by bone only about ten seconds. The Galton whistle, heard only close to the ear, and when blown very loud. The membranes are dull and markedly retracted: Usual naso-pharyngeal catarrhal conditions are present. This patient having been the rounds of a number of general physicians as well as specialists, office as well as clinic, did not improve; in fact, progressed for the worse. I treated her for four months by all the methods known to me or others, locally as well as generally. Finally, under general anæsthesia, I did the ossiculectomy, with only a partial effect of relieving the ear noises, and for a short time, but the head noises became worse. Consultation with a neurologist and a general practitioner before the operation, as well as after, did not clear up the condition for me, nor help me out in the least, and I did not know what next to do. One gentleman recommended the use of the X-Rays to the ears, which treatments she received for about three weeks, without the slightest relief. About that time I received my radium, and I applied it directly as far as I could to the tympanic cavity, every day for five minutes to one hour, for about six weeks, without the slightest improvement in hearing or the noises. There was absolutely no appreciable appearance on the drum membrane or canal of a burn or any action from the long exposure of the radium. I then discontinued the use of radium, and while studying the use of various rays, I decided to apply the high frequency current, which I suppose you are all familiar with. After eleven daily applications of the high frequency current directly to the ears, there is absolutely no improvement from this treatment. If the patient will stick to me, I shall do the operation of section of the auditory nerve, as described best by R. H. Parry in the *Journal of Laryngology*, Aug. 1904.

Case X. Mr. C., aged 17. Complains of a foul smelling discharge, from his right ear, and severe pain occasionally in the right ear and right side of the head. Examination: A large mass of malodorous pus with white scales was removed, microscopically examined, and shows cholesteatomatous cells, staphylococci and a large number of saprophytic micro-organisms, and a considerable amount of pus corpuscles. Thorough cleaning out of the ear showed a granulating surface, particularly up and back. Hearing is markedly reduced; however, bone conduction prolonged. An artificial membrane, temporarily applied, improves hearing. Probing demonstrates dead bone in the attic. Washing out of the attic and sedimentation of the fluid shows microscopically bone particles. Diagnosis: Chronic suppuration of the middle ear with necrosis, either of the ossicles or a part of the temporal bone, most probably the latter, because hearing is so good when membrane is applied.

Treatment. Applied radium for ten treatments, three days apart, each fifteen minutes, in the external canal, as close to the middle ear as possible. Results: The odor was markedly modified, and the discharge lessened. The bone remained rough to the touch of the probe, and the cholesteatomatous masses and bone particles could be demonstrated at each microscopical examination of the sedimented washings from the attic. Pains in the ear were less marked. I came to the conclusion that very likely the necrotic bone could not be acted upon by the radium, and since the patient wanted to know if I could promise a sure cure by the radium treatment, which I could not, I decided therefore to operate, and did so by the radical method, after which the patient was well.

Conclusions in this case are that the radium as it did in the syphilitic ozena diminished the odor, and relieved the pain; also diminished the amount of discharge, which perhaps was due to the bactericidal action of the radium.

Case XI. Miss B. T., 24 years old; referred to me by Dr. Ballenger to relieve severe pains in her ears and head. History: Always in delicate health; had ulcer of the stomach about three years ago; then developed tuberculosis of the lung; has had a discharge from the left ear since childhood, when three years old, which followed scarlet fever. Dr. Ballenger operated for this condition radically in Oct., 1902; following this operation the patient has had constant ache in the ear and head, and periodical discharge from the ear for about a year, when a second operation was performed by Dr. Ballenger. The last operation did not relieve the patient, so far as the pains are concerned, and in addition she complains of the right

ear, or, rather the right mastoid, being very painful; besides, most intense pains in the head, all the time. Prevents her from sleeping. Medicinal treatment, as far as the relief of the pain is concerned, has been very unsatisfactory. When I first saw the patient, six weeks ago, I found the following condition: An ill-nourished young woman, somewhat anemic; left ear discharging yellow pus; along the retroauricular incision, a small fistula leading towards the attic of the ear; surface of the tympanic cavity, or, rather, the cavity as the result of the two operations covered with granulations, but no rough bone or dead bone is discernible by means of a probe.

The hearing is markedly diminished in the left ear. The right ear shows no changes nor evidences of having had any suppuration. The mastoid is painful on deep pressure. The head all over seems to be tender on percussion. Drs. Williamson, Ballenger and myself think the condition is a tubercular process, and very likely the meninges are involved. I started the treatment with radium on July 11th, and have treated her daily up to the time this report is made. For two weeks patient showed not the slightest improvement, so far as the relief of her pain as well as being able to sleep were concerned. After that she said she could sleep better, and now for the past ten days she sleeps very well every night. The pains have not been affected in the least, although the patient is able to stand them better, because she rests well at night. The radium tube is placed in both external auditory meati, and into the nose for a period of ten, or fifteen minutes. The reason it was placed into the nose was because the action of the radium as a sleep-producing remedy is better obtained when placed in this cavity high up in the olfactory region, as near to the brain as possible.

There were two peculiar conditions developed in this patient, which may, however, be purely coincident. First, after the radium was in the nose or ear for a few minutes she developed a distinct flush of her face, very much like erysipelas, with a distinct line of demarcation, and with a rise of temperature to $100\frac{1}{2}^{\circ}$. M. Davidson reports two cases that he treated for carcinoma of the face wherein similar conditions developed as in my case, but the temperature was much higher in his case than mine. Temperature in my case might have been due to her supposedly tubercular disease.

There were several cases treated in my office not in the line of ear, nose or throat, by myself and other physicians, in order to prove or compare the results, and I wish just to refer to them very briefly. One case of rodent ulcer of an amputated stump in a man who has arterio-sclerosis generally. The ulcer would not heal for eleven

years, and after application of radium for ten treatments, ten minutes each, it healed perfectly.

One case of carcinoma of the uterus, removed by radical operation, after which she had severe pain; the radium was applied twice a week, and relieved the patient completely of the pain.

And several other cases, which, suffice to say, were all very satisfactorily treated.

Again, I have treated several eye affections with radium, but since this is not within the scope of my paper, and besides I wish to make this a special report at some future date, I will not say anything more about them than that the results are about the same as in the ear, nose and throat, and that is nothing very startling. I wish to conclude with an appeal: Let us learn more about this radium; let us not report prematurely on the results obtained, and do exaggerate just a little in order to stimulate others, because the stuff has certainly great virtues, and I am sure by the many men using and experimenting with it we will be able to place it just where it belongs in our therapeutic measures. I certainly promise to work at least one more year experimenting with the radium; as I already said, it is so difficult to get material, because it does not appeal to the patient that anything is being done for him, on account of the length of time that any result is seen.

Herewith follows a complete report on all the cases that I have been able to collect in English, German, French, Russian and Swedish, with a complete index of the literature:

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DISCUSSION.

Dr. DERRICK T. VAIL (Cincinnati, O.). This valuable contribution should not be passed over without some discussion, in order that the subject may be elucidated as much as possible. I have had no experience with radium and would ask Dr. Beck whether he finds that in his experience radium is as efficacious a therapeutic remedy as is the X-Ray with the various mechanisms we now have for applying it to the nose and throat.

Dr. GEO. W. SPOHN (Elkhart, Ind.). I have had considerable experience with the X-Ray, but none with radium. When it comes to the treatment with the X-Ray beyond the surface, I do not believe it is of much use. It is possibly of benefit in the ear, and in the nose where you can use a speculum and throw the ray on the lesion. Frequently one can cure a suppuration in four or five applications. But if it has to traverse healthy tissue, I have never had any results whatever in the mouth, nose or ear. In a case of otorrhœa in the external canal, and in the region of the drum, with a speculum, and without touching the other tissues, I have had good results. In case of mastoid troubles, with intense pain or suppuration, the high frequency current has been of service. Perhaps these cases would have gotten well anyhow, but the very painful symptoms of mastoiditis were overcome.

Dr. A. H. ANDREWS (Chicago). I want to commend Dr. Beck for the scientific work he is doing on this line. That radium has therapeutic properties is not disputed, but just what application can be made of these properties is still a question. I am very glad that Dr. Beck is taking the time and trouble to experiment and to report on his experiments, and that he is not so enthusiastic that his reports will be biased. I think he deserves the thanks of this society for the work he is doing and the reports he is making.

Dr. BECK (closing discussion). I will pass around this little bit of radium in a lead case, and you will see it is no wonder that the patient should be surprised that this put in the nose should do good. If the radium was not kept in this lead box when carrying it about in the pocket it would produce a burn that would heal slowly and produce the same changes as an X-Ray burn. The reason it should be preferred to the X-Ray is that we cannot put the X-Ray tube into the cavities we are treating. The skin men can use X-Ray better. You can put the high frequency apparatus into the nose, and that is the next best thing we have. We must accept radio-therapy, because it has great power. You will hear from it more and more, and I promise to report to this society at the end of another year my experiences with radium. The way I used radium in the case of ozena was with the head hanging down, over the edge of the table. I allowed the tube to remain from five minutes to a half hour. Radium is an absolute analgesic. It will stop pain, no matter where it is, provided you can get it in contact with the tissues. Its rays do not travel far. The Beta ray has only skin depth action. The Gamma ray goes through nine thicknesses of marble $1\frac{1}{4}$ inches thick, and if we had enough of these rays we could get better results. The Beta is the one to depend upon. Radium is quite expensive—50 milligrams cost \$100.00.

In cases of ear troubles I attach the glass tube containing the radium to a flexible probe like this and pass it down to the tympanic membranes and if a perforation is present large enough, directly into the middle ear. I may add that I have experimented in eye cases but am not ready to report at this time. Suffice it to say, however, that I have observed no wonderful results, but sufficient to encourage me to go ahead and experiment further.

THE ETIOLOGY AND DIAGNOSIS OF ACUTE NON-SUPPURATIVE OTITIS MEDIA.

BY WM. C. BANE, M. D., DENVER, COLO.

Barr, in his excellent work on Diseases of the Ear, considers acute non-purulent and acute non-perforative inflammation of the middle ear as synonymous. I do not so consider them. We have non-purulent inflammation that is perforative and again we have non-perforative cases that are purulent.

Why an otitis in one subject will be catarrhal and another purulent depends mainly upon two factors: First, the constitutional or blood state of the patient, and second, on the local exciting cause, including the micro-organisms.

In acute non-suppurative or catarrhal otitis media, we find congestion, edema and excess of secretion of serum and mucus. There is more or less ex-foliation of the epithelium. The active changes may be largely confined to the mucous membrane lining the middle ear, not extending into the connective tissue of the attic. Again the congestion may extend throughout the attic and into the mastoid, and yet the active secretion be largely confined to that portion of the middle ear nearest the vibrating membrane.

Etiology. The season of the year plays an important part in the cause of otitis media. We observe that the cases are much more numerous during the after part of the winter and early spring months than the other months of the year. Manifestly this is due to the sudden and severe changes in the weather. It is doubtful if there is any material difference between a dry and a humid atmosphere as a causative factor, but we would naturally consider that the humid atmosphere is the more conducive to disease of the mucous membrane.

In the winter season the diet is richer and less easily digested than at other seasons. The digestive system being disordered or the diet unsuitable, there is likely to be an excess of secretion from the mucous membrane of the alimentary tract, as well as the pharyngeal membrane and glands. The general state of the system has much to do in the warding off or contracting of colds. Overheating of the body by exercise, followed by exposure to a draught, causing reabsorption of the perspiration is a very frequent cause of

what is commonly called "a cold," that extends to the ears. Sea bathing without proper precautions, or the accidental conveyance of septic matter into the middle ear by the nasal douche may precipitate an attack of otitis media. Injury to the middle ear through the canal and membrana tympani may be the exciting cause of an acute otitis media that subsides without suppuration. The most common cause of otitis media is the extension of the inflammatory process in pharyngitis and rhinitis along the Eustachian tubes to the middle ear. The discharge in rhinitis is often forced through the Eustachian tubes into the middle ears by improper blowing of the nose, thus infecting the ears and exciting an otitis. Operations in the nose, as turbinectomies, are occasionally followed by otitis media. Adenoid growths in the vault of the pharynx are a fruitful cause of catarrhal otitis media. During the teething period children are liable to attacks of acute catarrhal otitis media that may become purulent. The acute otitis media occurring in the course of measles is frequently of the non-suppurative type. That of influenza may be catarrhal but is more apt to be purulent. In typhoid fever the middle ears become involved in about 4% of the cases and may be catarrhal or purulent.

Diagnosis. Experience has taught us that the symptoms in the adult are as a rule less severe than in the child, and there is less constitutional disturbance. At first there is a feeling of fulness in the ear followed by pain. At the beginning the pain is slight and intermitting, gradually growing worse for a few hours, then remaining at a standstill or diminishing. The pain having commenced during the night may cease by morning, though the full feeling and dullness of hearing remain. The pain is increased upon lying down. Again the pain may be quite severe from the start and increase in severity until it becomes excruciating. After the stage of maximum secretion has been reached the pain diminishes, yet the dullness of hearing, accompanied at times with a heavy feeling in the side of the head, continues. Should rupture of the membrana tympani occur, marked relief of the pain and pressure or fulness follows immediately. The non-suppurative type not ending in rupture of the drum head, there remains the dullness of hearing and full feeling that may last from one to several weeks, and ere recovery takes place, there may be relapse into a more acute stage. During the act of swallowing or blowing of the nose the air entering the middle ear may produce a crackling sound from the air mixing with the serum or mucus in the ear. There is usually tinnitus that varies according to the pressure on the labyrinth.

In the adult the temperature is not likely to be elevated to any great extent, if at all, unless the disease spreads to the mastoid or

attic. In children, however, the temperature not infrequently runs high. With the discharge of the serum or mucus, the temperature usually drops and if the child, the patient, becomes quiet and goes to sleep. The color and consistency of the discharge vary according to the stage of the inflammation. Early it is serous. After the second to the fourth day it is likely to be sero-mucus. In the mild cases the membrana tympani appears at first congested, especially in the flaccid portion and along the handle of the malleus.

In the severe cases the whole of membrane becomes congested, loses its brilliancy, and assumes a reddish gray color from the congestion and infiltration of the dermal layer. As the exudate increases in the middle ear the drum head is forced outward, frequently appearing as a ring about the umbo. The bulging may include both the vibrating and flaccid portions of the drum head, but when the flaccid portion is involved the case is most likely to be purulent. At first the congested drum head may appear somewhat retracted, due to the lack of air in the middle ear, and from early closure of the Eustachian tube. This, however, may be but temporary. Again the drum head, while congested and subjective symptoms are those of exudation in the middle ear, it may not show any or vary slight bulging owing to the density of the membrane. Occasionally there will be observed vesicles on the drum head or the bony wall of the canal near the drum head filled with serum or blood. The distension of the vesicles causes a great deal of pain and discomfort. In myringitis the pain is located external to the middle ear and the hearing is much less interfered with than the otitis media with exudation. In the acute purulent otitis media, the pain is as a rule more severe and the constitutional disturbance greater than the catarrhal type.

The appearance of the drum head when the middle ear is partially filled with exudate may or may not convey to the experienced eye any definite information as to the character of the exudate. When only the vibrating portion of the drum head is bulging and is sufficiently translucent, the upper limit of the effusion may be seen and the color may possibly aid one in deciding whether the fluid is mucus or pus.

THE TREATMENT OF ACUTE NON-SUPPURATIVE OTITIS MEDIA.

BY EDWIN PYNCHON, M. D., CHICAGO, ILL.

Under the title given may be included the several acute inflammatory manifestations of the middle ear structures which have been described by various authors as respectfully: Acute myringitis, tubal salpingitis, acute catarrhal otitis, otitis media acute, etc., all being closely related, and in fact rapidly merging one into the other, so the chief consideration in treatment is as to stage or degree.

Owing to the frequency with which acute catarrhal otitis media occurs, particularly during child life, being usually described as "earache," and so often due to adenoids,¹ its prompt and correct treatment is of the greatest importance in order not only to relieve the annoying symptom of pain, but also in order to avoid those more serious sequela which may otherwise follow.

Certain patients are prone to attacks of acute ear trouble, while others are never thus afflicted. As all are alike subjected to practically the same exposures or climatic conditions, it becomes apparent that such susceptibility must, in a great measure, be due to local troubles present in those patients thus afflicted.

Chronic inflammation of the Schneiderian membrane, extending through continuity of tissue to the Eustachian tube, is an important etiological factor to be considered and, in a general way, defective nasal respiration associated therewith, whereby the nasal secretion, instead of being evaporated, is retained, so through deterioration it causes or intensifies the chronic inflammation alluded to. In the very young, enlarged tonsils and adenoids can be justly credited with being the almost invariable causes of the obstruction, which accounts for the defective nasal respiration, while in older patients intra-nasal hypertrophies, or intumescence from local or systemic causes, are often additionally present. Foreign bodies in the nose may be a cause of nasal occlusion or infection at any age, as well as traumatism, and particularly the use of powerful styptics, as Monsel's solution, upon intra-nasal tampons in order to control post-operative hemorrhage. Acute otitis media may also result from traumatism of, or inward extension of inflammation from the external auditory canal, or it may occur as an acute eruption of a chronic suppurative otitis media with perforated membrana tympani.²

Acute catarrhal otitis media has been, by different authors discussed conjointly with the acute suppurative condition. While the acute form of middle ear inflammation may, up to a certain stage, be regarded as "non-suppurative," it is a fact conceded by nearly

all writers that pathogenic invasion into the middle ear is an ever present factor^{2,3} and that the degree of virulence from such invasion is tempered by the character or combination of varieties of organisms present^{4,5} as well as by both the amount of infective material introduced and the resisting power of the patient. The natural collection of infective material about the tubal orifice is largely due to the structural formation of the post nasal space, as well as to the proximity of this orifice to Luschka's tonsil which, when either hypertrophied, or in that not infrequently observed condition of degenerative atrophy, becomes an ideal culture field for pathogenic organisms. Attention must also be called to the supra-tonsillar fossa, the infective material in which, beginning with early adult life, is in different ways a factor to be remembered. It has also been granted that defective teeth may have an important causative relationship.⁶

Owing to the short and more open Eustachian tube in child life the chance for ingress of pathogenic material, so freely available from the ever present adenoid growth, is increased, hence middle-ear trouble in young children may be generally regarded as suppurative, even though there may exist no rupture of the membrana tympani or external discharge, owing to the short and more patulous Eustachian tube, and in fact, after such infection, an unrecognized suppurative otitis may for months continue, the escaping and swallowed secretion from which is the cause of persistent gastric disturbance.^{1,7} In such case the pain is regarded as neuralgic and the recurrent febrile disturbance is too often accredited to "teething."

The causative factors have been thus cited as it is the duty of the attending physician, after the subsidence of an acute ear trouble, to advise as a prophylactic step the removal of all obstructive or contaminating tissues present in the upper air passages, and thereby correct the defective nasal respiration so as to avoid the tendency to recurrence of acute ear troubles.

In the development of an acute otitis media, there is first a brief stage of intra-tympanic rarefaction, owing to tubal stoppage, with the membrana tympani retracted, whereby, owing to negative pressure, serous or hemorrhagic exudate in the middle ear is induced, which in turn, through imprisonment, soon causes pressure with a bulging drum head, and may be considered a second stage. As the secretion is retained, it becomes more viscid.

Among the symptoms of acute middle ear trouble, pain may be regarded as the most important, though it is not always present, and is more liable to be of brief duration in young children, owing to the shorter and relatively wider Eustachian tube, whereby an exit of

the middle ear secretion is more readily secured than with adults. Subjective sounds and reduced hearing acuity with fullness of ear are promptly noted by adults, though rarely complained of by children. In adults autophonia is commonly reported, and vertigo occasionally, while delirium and convulsions are chiefly manifested in children. In all cases there is some febrile reaction, which in children may be quite pronounced, constituting the most important symptom. In fact fever when of sudden development, particularly in children, may at any time suggest ear trouble.²

Among the exciting causes the exanthemata and grippe are of the most importance from a numerical standpoint, though typhoid, acute nephritis and pneumonia must be mentioned. When grippe is the cause, there seems to be an increased danger of serious otitic infection. Another common exciting cause is the getting of water in the post nasal space while bathing, or from the improper use of a nasal douche, in which case the water entering the Eustachian tube carries in microorganisms from its entrance.² In fact, any exposure which results in coryza may cause an acute ear trouble, particularly when vigorous sneezing occurs, or when the nose is too vigorously and incorrectly blown.

In acute catarrhal otitis the element of pain, in the first stage, is due to the forced process of exudation from sudden rarefaction, which explains how the escape of a very minute quantity of fluid after a paracentesis may give such prompt relief, while later, in the second stage, it is due to intra-tympanic pressure and bulging of the drum head from the imprisoned secretions, which are augmented by the inflammatory process. With this understanding, it becomes apparent how promptly resolution will follow if in the early stage the imprisoned secretion can be released, so air will be substituted for fluid in the tympanum. The natural process whereby a spontaneous cure often occurs is from absorption so, through subsidence of the swollen tubal mucous membrane, a vent is given to the imprisoned secretion, and incidentally an entrance for air.

The ideal treatment, therefore, in this condition, when possible to be employed, is the prompt and early use of the intra-tympanic air douche. Inflation for this purpose has been both praised^{8,14} and condemned³ by different writers, though all appreciate the fact that a cure can be facilitated by the re-establishment of tympanic drainage and the restoration of atmospheric equilibrium. The question is, how may this be safely and readily accomplished? The tube being stopped, an increased pressure is required, particularly by the method of Politzer, in order to pass the obstruction, and in fact with the necessary pressure required in order to effect Politzerization,

the fluid in the tympanum may be driven into the mastoid cells, or the drum-head ruptured. Furthermore, infective material from the tubal entrance may thus be driven through to the tympanum so the patient is subjected to both intense pain and the danger of further infection. With this view, it is not strange that many writers should decry the use of the air douche and should instead advise paracentesis whereby is imitated nature's alternate plan of termination when resolution fails.

The attempts at inflation which have been decried have, I believe, always been intermitting impacts, and when of enough power to pass the obstructed tube have often caused the undesirable phenomena previously cited. In acute intestinal obstruction, as from intussusception, intermitting douches, where the fluid is allowed each time to escape, have proved ineffective, and even harmful, while the constant stream, with intermitting halts, but no escape, has passed the obstruction and given relief.⁹

In a previous paper, presented before this association six years ago¹⁰, I described a method of inflation based upon the philosophy outlined in the preceding paragraph, it being a method whereby I have on several occasions successfully aborted an acute catarrhal otitis. As I have not since learned of others putting in practice the method described, I fear it failed to catch the eye, as well as the ear, of otologists generally.

The method alluded to, in brief, consists of the use of a constant in place of the intermitting air current, having at hand means for absolutely controlling and regulating the air pressure¹⁰, and always employing a catheter, and using a vapor or nebula in place of plain air, for it must be a poor nebula indeed that is not better and more aseptic than unmedicated air.

The philosophy of this method is based upon the fact that as the vapor enters the tube it proceeds to the point of obstruction, and then retreats along the path of entrance, hence there is both a constant in-going and out-going current which *cleanses the tube of secretion*, particularly about the orifice. The continuous action of the air current is naturally most intense at the point of obstruction, so between its action, and the effect of the medicament employed, the obstruction is shortly passed, and the patient experiences a bubbling in the ear, which is also heard by the operator through the auscultation tube. I begin with about a 6-lb., pressure, and gradually increase it to even 15 lbs., or until an entrance is effected. In these acute conditions I have found a chloroform vapor to be most effective. After the obstruction is passed, I have the patient tilt the head so the affected ear is uppermost, and allow the constant stream, with occa-

sional breaks, to enter the middle ear for possibly a minute or so. In the selection of a catheter, I prefer one of silver with a bulbous tip, and am particular that the distal opening shall, for a short distance, be reamed out and made conical or rounded, so as to have no angular edge, or in other words, so the opening will be rounded inwardly, as is the outer bulbous end rounded outwardly.

I have also a suggestion to make relative to the introduction of the catheter. The methods usually advised require the touching of the point of the catheter against the posterior pharyngeal wall, or else against the upper surface of the soft palate, either of which steps will often cause retching. My method is to introduce the catheter in the usual manner, but with a slight rotating pressure of the dependent point of the catheter against the septum, as it is gradually entered, until the posterior end of the septum is reached, when, owing to the rotating pressure, the curved end tips up to the horizontal, when the catheter point, by being rotated downwardly, or in the opposite direction about 180 degrees, will enter the Eustachian orifice. In the case of a sensitive nose, I precede the introduction of the catheter by a brief application of cocaine to the septum and tubal orifice.

If the first treatment is given in the forenoon, I advise a repetition in the afternoon, and again daily for the next day or two, though I have in several cases had a complete cessation of all pain after one treatment. For patent reasons, the treatment outlined can only be employed with patients who can visit the office, and with adults, or those resolute enough to permit the introduction of the catheter. In all other cases the treatment of election is the employment of heat. Tobacco smoke has often been blown in the external ear with benefit, though, with our modern office equipment, much better methods are available for the use of heated air. For the past two years I have been using a Seeley hot air apparatus, made by F. A. Hardy & Co., of Chicago, which I have found to be both efficient and convenient to use. Another device which I have found of particular value in effacing the lame feeling or soreness about the ear, which can be used during office treatments, is a mechanical masseur. I have for some time been using a cleverly constructed device of this kind, operated by compressed air, being both small in size and of ample power, and made by the Globe Nebulizer Co., of Battle Creek, Mich.

Generally speaking, in the treatment of acute ear inflammations, hot aqueous douches are, for many reasons, to be preferred. For several years, in such cases, I have depended largely upon the frequent employment of a hot one per cent. carbolized douche, to be used

at least every two hours, while during the interval dry heat is continuously applied with the aid of a Japanese hot box. In order that the douche will be properly used, I give the patient a printed sheet of directions, of which the following is a copy :

"DIRECTIONS FOR THE USE OF INJECTIONS IN THE EAR.

"Dissolve one teaspoonful of Carbolic Acid in a teacupful of hot water, and stir with a teaspoon until thoroughly mixed or dissolved. Then add enough warm water to make one (1) pint. It should when used, be as warm as can be comfortably borne by the ear. The best kind of a syringe to use is a Fountain Syringe, of not less than the No. 2 size, which holds one quart. Put in the bag the warm solution which has been prepared and hang the bag as high as the top of a door, so that when the patient is seated there will be a fall of about four (4) feet from the bag to the patient's ear, though the height of fall should be so adjusted as to never cause discomfort. If at all painful lower the bag.

"Use the smallest size of hard-rubber tip, which should be slightly introduced just within the opening of the ear, but *must never be pressed in against the ear so hard as to cause pain or prevent the free escape of the injection* into a bowl which should be held below the patient's ear.

"Use the entire pint in this way in one ear and, when required, use a similar quantity in the same way in the opposite ear. Repeat the injection 8 to 12 times daily as directed."

During the interval between office treatments in mild cases, and always in the more severe cases, it is best for the patient to be put to bed. Internal medication as indicated is to be administered, particularly the so-called vegetable arterial sedatives as aconite and gelsemium, which I find much better adapted to allay the febrile tendency than are the more modern coal tar antipyretics, though for the simple allaying of pain, antipyrin is valuable. The intestinal tract must be kept free and the diet regulated. Leeches in the past have been much used, though I believe the hot phenol douches are to be preferred. The application of cold, with the ice bag, I regard as of value only in the early stage of mastoid involvement. Cotton moistened with a 10% solution of phenol in glycerin should, in the early stage, be loosely packed in the external canal and against the drum-head, from which benefit is derived through the process of osmosis.¹¹ Another agent which I sometimes apply in a similar manner upon cotton, which is both cooling and anodyne, is Baume Analgesique.

Even in cases wherein the air douche has been successfully employed, I advise the use of heat, and the following of the other suggestions for treatment enumerated.

The desirability of cleansing and keeping clean, so far as possible, both the nasal passages and post nasal space is advised by all writers. For cleansing the tubal orifice, what could be more efficient than the air douche derived from the continuous air current used as described, being far more effective than can be the use of sprays, etc. Another method I employ for softening and removing tenaceous secretions in this locality is by the use of a long and delicate cotton application, bent like an Eustachian catheter, the end of which is liberally wrapped with cotton and moistened with some glycerin preparation. Personally I use Mxt. D. P. which contains about 75 per cent of glycerin, with six per cent each of soda and borax.¹² Proper blowing of the nose is another means whereby the advantage of air cleansing can be obtained, when nasal obstruction is not too pronounced, and must be done very gently, and at first only with both nostrils open, with the head bent well forward over a washbowl or sink while the patient is standing. After this the handkerchief can be used gently in the usual manner.

Lastly, if there is not a prompt subsidence of pain and other manifestations, paracentesis must be done, and the call for this step hinges largely upon the stage of the disease and upon the character and location of the intra-tympanic contents. In the more mild forms of infection, the retained secretion is a serous transudation in the atrium, while in the more virulent infections, which are considered suppurative, the tympanic vault becomes involved, and in fact, as soon as this location is known to be the field occupied, a free paracentesis should be done without delay.

I must add that after the drum head opening, whether by spontaneous rupture or by incision, I have failed to appreciate any disadvantage from the use of the hot carbolized douche, when used with the precautions specified on the printed sheet of directions, and when douches can be employed with sufficient frequency, I greatly prefer this method instead of the use of the so-called "dry treatment," until the discharge has practically ceased, when the latter method is admirable until the drum-head has healed.

Following a paracentesis, gentle suction with a Siegle pneumatic speculum employed once daily in the external meatus, in connection with other indicated treatment, including inflation, will facilitate rapid recovery, the patient meantime practicing auto-inflation by the Valsalvan method several times daily, and, after the first week, the use, for a few days, of pneumatic massage with a mechanical aural

masseur¹³ will not only further facilitate the cure, but will also help to diminish or prevent the tendency toward impaired ossicular mobility, which so often follows acute inflammation of the middle ear.

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DISCUSSION ON PAPERS OF DRS. W. C. BANE AND EDWIN PYNCHON.

Dr. J. M. FOSTER (Denver). I feel this academy is to be congratulated on the selection of this subject for a symposium. These patients are so depressed and discouraged that we are often at our wit's end to do anything for them after the acute stage has been passed. Appreciating, as we do, the failures in the chronic cases and the marked success in the acute cases, we wonder that the general practitioner has not appreciated the importance of curing middle ear catarrh. It is hard to convince him that it can be cured so easily. Neglect of these cases often leads to serious and fatal consequences. The symptoms of this disease are readily recognized in the adult, but in children it is not so readily done, especially where the drum is but slightly congested and where the auricle is not sensitive to pressure. But even in infants the time is now past when any of us are willing to allow the appearance of the discharge to make the diagnosis for us. There is one variety of acute non-suppurative infection of the middle ear that was not mentioned by the essayist, that is the acute hemorrhagic inflammation which was called to my attention some years ago by Dr. Roosa. The symptoms are all severe and are shortly followed by perforation of the drum and a discharge of blood. This in turn is followed by prompt healing of the affection as quickly as it came on. I thank Dr. Pyncheon for suggesting this inter-tympanic hot air douche. Its use must be limited to a small number of adult cases as it is impossible to use an Eustachian catheter on most children. I have not had any good re-

sults with the use of the Politzer method during the stage of pain and I think that any method that will help these cases should be gladly received. I am somewhat surprised that more stress has not been laid on local blood letting. The results from that are marvelous at times. Early paracentesis is without rival the best plan of treatment in many cases and I had expected more to be said about local anæsthetics in puncturing the drum head. I have been disappointed so frequently in using them that I have gone back to nitrous oxide and ether in most cases. I think it is important to disinfect thoroughly the external auditory canal and Eustachian tube before and after puncture, and it is important to keep it antiseptic. I like this little aseptic package of Dr. Beck's for packing the canal as there is less danger of infection. A great many of these cases which are aseptic when first operated on, are very readily contaminated through handling. In order to make a prognosis in many of these cases it is often necessary to have a bacteriological examination of the discharge, determining thereby if pneumococci or streptococci, etc., are present. I have found the packing of the canal is a better method, after the pain is over, then the wet or dry powder treatment. It is so easy to get too much powder into the ear so that it packs and becomes hard to remove, and syringing injudicially or too long will keep up the discharge indefinitely.

Dr. JOSEPH BECK (Chicago). The recent writings of the students of this subject have been against an early incision of the tympanic membrane in the acute cases. It has been my rule, as the previous speaker mentioned, to make an early incision; but a year ago, after the German Congress of Otologists met, I was convinced I made a mistake in doing so. I think I had many cases of sub-acute and chronic otitis media develop in consequence thereof. I mean that I now wait longer than I used to before resorting to the incision of the membrane, and find that complete resolution often occurs. I believe we see many of the cases in children and call them earache, making the diagnosis. I use carbolic acid drops in the ear to relieve the ear ache. I meet most of the cases of otitis media following influenza, and these cases referred to as hemorrhagic conditions of the drum are those following acute influenza infection in many instances. When these hemorrhages are present, with the intense pains, knowing that complications in the mastoid will follow, I make an early incision into the drum. In connection with anæsthesia, I have found that menthol, carbolic acid and cocaine in full strength give good results. The operation is not done without pain, but little compared to the anilin oil and cocaine solution which is objectionable on account of toxic action.

Following paracentesis in the cases of acute otitis media following an attack of influenza, we often see develop a protruding mass, looking like granulation tissue, which is known as the tit-like perforation and this is known to markedly interfere with drainage. These acute cases, when they first rupture, or after an incision of the drum membrane, I usually pack and drain with gauze; and when I can not do it my self I intrust my patient's friend or relative to pack the ear, after having them thoroughly instructed how to do it by using my packing outfit, demonstrated to you this morning.

Dr. F. W. DEAN (Council Bluffs, Ia.). In these cases it is my habit to treat the nasal passages and pharynx. I also give carbolized glycerine 10% and order it dropped in the ear frequently. This stops the pain and reduces the inflammation to a great extent.

In Dr. Pynchon's printed directions to the patient he suggests the use of the smallest tip of the fountain syringe and warns the patient not to press it against the ear as that would cut off the return flow. If instead of using any of these hard rubber tips he were to use the glass tip of an ordinary medicine dropper he would find that precaution unnecessary.

Dr. S. H. LARGE (Cleveland, O.). I think the treatment should be divided under two heads, those in which we get a bulging, and those in which we get a congestion. There is only one treatment in bulging, and that is paracentesis. Ethyl chloride as a general anæsthetic is very good in these cases.

The danger of using too much hot water in the external canal is that it tends to soften the tissues, and if the middle ear becomes infected when your drum ruptures you get a general diffuse suppuration of the external canal.

Dr. A. H. ANDREWS (Chicago). In speaking of the etiology of these cases, it seems to me that the most important thing before instituting treatment is to try to decide whether it is a case of catarrhal otitis or a case of purulent otitis. I believe they are two separate varieties, one due to pyogenic micro-organisms, the other of the catarrhal type. It is possible to have a vaso-motor disturbance of the blood vessels of the middle ear, bringing about a pouring out of fluid which produces pressure and pain and will perforate and may later become purulent by secondary infection. The druggists throughout our country prescribe more often for acute otitis than the specialists. The people go to the drug store rather than to the doctor for something to cure ear ache. We should do what is in our power to convince the public of the fallacy of such a procedure. With regard to the treatment, it is not always easy to differentiate between these two classes of cases. There are cases between the two

extremes. The cases coming during measles or scarlet-fever or late in influenza are purulent. Those in the course of ordinary rhinitis are more apt to be catarrhal. Otitis media coming early in influenza is amenable to the abortive treatment. If late, it is due to mixed infection, is purulent and apt to be rapidly destructive. The treatment I use is carbolic acid and glycerine on a pencil of cotton, and applied in such a way that the end of the cotton lies in contact with the drum membrane. If not held so by a pledget, the exudate passing through the membrane by osmosis washes away the glycerine and osmosis ceases.

Dr. L. B. LOCKARD (Denver). Politzer made the statement many years ago that in children a strumous diathesis paracentesis would almost invariably produce suppuration. It will do so much more quickly in that class. I have had a good chance to verify that. Suppuration will occur, no matter what precaution we take. In these cases we should delay paracentesis longer than in children of a normal habit.

Dr. J. A. DONOVAN (Butte, Mont.). I started to write a paper for the Montana Medical Society, which will be published (Medical News, Sept. 17, 1904), for which I apologize to Dr. Pyncheon. I started with the intention of advocating the early free incision in all cases that did not subside in 24 or 36 hours. I read a paper by E. H. Hazen advocating the catheter. Before completing my paper I had eight cases in succession in only one of which I had to make the incision, and I changed my paper before reading it to recommending the catheter and air hot as can be borne used continuously three to five minutes. In early stages, hot water with a return flow douche is the best thing we have to relieve the congestion, and after using it twenty minutes to an hour, I advise the patient to dry the ear with cotton and then put in the carbolized glycerine.

Dr. G. W. SPOHN (Elkhart, Ind.). There is very little stress put upon the general treatment in these two papers, which cover the ground very thoroughly otherwise. I cannot see how Dr. Pyncheon could go wrong, because he covers the field so thoroughly, but I believe we should all give more attention to the internal treatment than is stated here. Otitis media is generally due to troubles in the post nasal cavity and I believe we should treat the nose throughout at the same time we are treating the ear. Dr. Donovan does a paracentesis in 24 or 36 hours in a certain class of cases. I agree with him; but if we get a free catharsis with sulphate of magnesia, we will get results more quickly than we would otherwise. I had a few cases in the past year where I did the paracentesis in 24 hours for bulging, and the result was the discharge ceased in 48 to 72 hours.

In the opposite ear of the same patients I did a paracentesis four or five days after that. It was three to four weeks before the discharge could be stopped, showing that an early paracentesis is necessary. I used the dry treatment in both cases. I believe that a great many of these cases are overtreated, and if more attention is given to the medicine internally and to the nasal treatment, we will get better results.

Dr. DUDLEY S. REYNOLDS. I wish to emphasize the statement by the last speaker in regard to internal treatment. I wanted to hear somebody call attention to the value of revulsion. I often use this; one grain calomel, half grain podophyllum and three grains bicarbonate of sodium, followed in two hours by ten grains salicylate of sodium in camphor water diluted with a large tumblerful of drinking water.

The salicylate of sodium may be repeated every half hour until pain ceases. In cases where bulging occurs, my practice is to mop out the external canal with camphophenique. There is mentioned in the U. S. Dispensatory camphorated phenol, but the preparations are different. That which I use is composed of equal parts of crystallized carbolic acid, and gum camphor rubbed together until liquified. It must not be diluted, or applied to a wet surface.

Dr. H. W. LOEB (St. Louis). I would add one hint as to the relief of pain; the use of aspirin. It is a compound of the salicylic type and will relieve pain, given in large doses of ten grains, repeated in half hour or hour if necessary.

Dr. PYNCHON (closing discussion). Dr. Foster spoke about the symptoms in children being different from those in adults. This was touched upon in my paper, but was omitted in the reading. The reason the anæsthetic spoken of is not effective is that it is improperly applied. The way to apply the mixture is to first clean out the canal, preferably with a little peroxide of hydrogen and next dry with hot air. Then a small quantity of the anæsthetic should be put on cotton and allowed to remain against the drumhead for a sufficient time. Five or ten minutes are not sufficient but about twenty minutes will be required to give anæsthesia. I also touched on influenza in the part of my paper omitted. I have been using hot douches in the way I have recommended for the past ten years without bad results. In reply to Dr. Spohn, I will say this is an extensive subject and I could not touch upon everything, but only on those things which seemed to be most important, leaving it to the discretion of the attending physician to follow out general treatment as indicated. (Dr. Pynchon showed a little instrument for use at the bedside when inflation is required, being much smaller than the usual Politzer hand bag.)

THE DIAGNOSIS AND DIFFERENTIATION OF CHRONIC NON-SUPPURATIVE OTITIS MEDIA.

BY WM. LINCOLN BALLENGER, M. D., CHICAGO, ILL.

In response to the request of the Committee on Program, I have the honor of discussing the diagnosis and differentiation of the several types of non-suppurative diseases of the middle ear, about which much confusion exists among otologists. There is greater confusion in this than in European countries, especially in Germany and Switzerland, as it is through the observations of a few of their indefatigable workers, that we are made acquainted with some of the finer distinctions between the various types of non-suppurative middle ear diseases. It is therefore on account of the prevailing misconception of the points bearing upon the differential diagnosis that I shall attempt within the brief time allotted to me, to present the status of the subject as I understand it.

It will simplify the discussion if we agree that spongifying or rarifying osteitis of the bony capsule of the labyrinth in its uncomplicated form, is a disease of the sound conduction apparatus, rather than of the sound perception apparatus. The word labyrinth would seem to imply that the lesion is of the labyrinthian contents, or sound perception apparatus. It is partly on this account that so much confusion exists in reference to the clinical diagnosis. While the lesion is chiefly in the bony capsule of the labyrinth, it in no way affects the termination of the auditory nerve. It is only in complicated cases that the acoustic nerve-apparatus is involved. As this symposium is restricted to the affections of the middle ear or conduction apparatus, the labyrinthian complication should be considered as incidental to the main theme under discussion. The conduction apparatus embraces all the parts of the ear external to the labyrinthian contents. The oval window and the foot plate of the stapes and fibrous membrane surrounding it are, therefore, parts of the conduction apparatus. Rarifying otitis is chiefly confined to the bony tissue in the region of the oval window, and interferes with the vibrations of the foot plate of the stapes and the membranous ring of the oval window. Some of the subjective symptoms, therefore, are similar to those produced by lesions in other portions of the middle ear. It should be stated, however, that the contents of the labyrinth or perception apparatus are also sometimes involved in the extension of the osteitic process. In such cases, the

usual clinical phenomena of labyrinthian disease are present. As spongifying of the bony capsule of the labyrinth does not usually impair the vital parts of the cochlea, the disease is properly classified under middle ear affections. We will, therefore, so classify it, and consider it in the differentiation of the non-suppurative forms of otitis media.

For the purposes of this discussion, the diseases of the ear of a non-suppurative type are classified under three headings, namely :

- a. Moist or secreting otitis média.
- b. Adhesive otitis media.
- c. Spongifying, or rarifying osteitis of the bony capsule of the labyrinth.

Spongifying is also described under various other titles as capsulitis labyrinthæ, oto-sclerosis, etc. Personally, I prefer the terms spongifying and rarifying osteitis of the bony capsule of the labyrinth, as they seem to more nearly describe the affection. Spongifying is a descriptive term which suggests the gross microscopical appearance of the change in the tissue, while rarifying osteitis is the most probable pathological description of the disease, although this is still under discussion.

That there can be still further subdivisions of non-suppurative middle ear diseases there is no doubt. For instance the secretive type can be split into the chronic congestive otitis media, chronic hypertrophic otitis media, etc. It is safer, however, in the present state of our knowledge, to limit the classification to the three headings already given.

THE DIFFERENTIATION.

The *appearance of the drum-head* in the *moist* or *secreting* variety of non-suppurative ear disease is usually in such marked contrast to either the adhesive or spongifying varieties, that it is only necessary to mention some of the more prominent distinctions to make it clear that the differentiation in this respect, at least, is usually quite easy. The presence of fluid within the middle ear cavity gives to the drum-head certain characteristic features that are demonstrable by inspection, inflation, movements of the head and paracentesis. Upon inspection, the upper limit of the accumulated secretion is marked by a white or grayish line, more or less irregular in outline according to the contour of the face of the drum-head and the consistency of the fluid. If the drum-head is thin and transparent, the fluid below the line of reflex light appears as a yellowish or grayish mass.

Inflation is attended by moist, bubbling rales, and by the formation of globules of air, which may be seen through the transparent

membrane to slowly rise to the surface of the fluid. Movements of the head are attended by a sense of crawling or tickling in the middle ear, on account of the slowly shifting position of the contained secretion. In those cases in which the drum-head is rendered opaque by infiltration or other pathologic process, we are not aided by the appearance of the drum-head, but must depend upon the moist, bubbling rales, as heard through the auscultation tube during inflation, or upon paracentesis and the use of Siegle's otoscope. If after paracentesis and suction through the otoscope a serous or viscid secretion is drawn into the external auditory canal, the diagnosis is clearly catarrhal otitis media.

The *appearance of the drum-head in adhesive otitis media* is quite different from the foregoing description. The lines of reflex light marking the upper limit of the secretion are absent for obvious reasons, and the bubbles of air do not appear after inflation. The characteristic appearance of the drum-head in this type of the disease is due to the formation of fibrous bands and adhesions, which either directly involve the ossicles, the drum-head, and the other walls of the tympanic cavity, and may be seen through the transparent membrana tympani. If the disease is but slightly advanced, small, fine striæ may be seen to cross its surface. Sometimes they are radiating in direction, but according to my observation, they are more often irregular in their outline. In the more advanced cases, the fibrous bands are larger and often retract the drum-head irregularly inwards. The bands are often quite resilient and stretch if suction is exerted through Siegle's otoscope, thus causing the observer to mistrust his first conclusions as to the presence of the fibrous adhesions. In the more advanced cases the adhesive bands do not stretch upon suction through the otoscope, but hold the adherent portion of the drum-head in a retracted position, while the remainder bulges outward. In still other cases, the drum-head is directly adherent to the inner wall of the middle ear, and presents a reddish or grayish appearance at the site of the adhesion. In these cases, inflation is attended by a balloon-like expansion, especially in the post-superior and the antero-inferior quadrants, where the membrane is unattached and is ample in area. It often happens that the adhesive process is confined chiefly to the marginal portion of the drum-head and to the contiguous walls of the tympanic cavity. In these cases, the drum-head presents a drawn or puckered appearance at its periphery.

In nearly all cases of adhesive formations in the middle ear, the position of the malleus is changed. It is retracted and rotated upon its axis, thus presenting a fore-shortened and broadened aspect.

The broader appearance is explained by the wider surface of the rotated malleus being turned toward the observer's eye. The short process and posterior fold are more prominent than normal for obvious reasons.

The drum-head presents a mottled or diffused ground glass appearance, especially behind the handle of the malleus, where it usually assumes a crescentic shape. The ground glass opacity is also sometimes located in the margin of the drum-head, and in still others the entire drum-head presents this appearance.

The cone of light is but slightly changed in many cases while in others it is somewhat narrow and irregular. It is rarely absent in its entirety. The adhesive bands and the prominent folds are marked by bands of reflex light.

If the membrana flaccida is adherent to the neck of the malleus, there is a deep pocket in this region. In general it may be said that the adhesive bands and points of adhesion are chalky or whitish in appearance, though in some cases they are red, while the intervening membrane is bluish or gray in color.

Inflation is usually attended by the normal soft blowing murmur, in contrast to the soft, bubbling rale found in the secreting form of otitis media. If the drum-head is inspected during inflation, only portions of it will be observed to bulge, often giving the appearance of a globular or an irregular bulging mass. If the handle near the umbo is adherent to the promontory, the anterior and posterior portions of the drum-head may protrude so much after the inflation as to conceal it from view.

The appearance of the drum-head in *uncomplicated spongifying* or rarifying osteitis is usually normal. It has been pointed out by Schwartze that there is sometimes a reddish or yellowish lustre behind the umbo.

The drum-head in spongifying does not, however, always present a normal appearance, especially in elderly people, and in those cases complicated by the adhesive type of otitis media. In these cases the diagnosis is rendered difficult. Indeed, there are no means at our command whereby we can in all cases make a differential diagnosis. That is, we can never be quite certain that the case is one of spongifying when the adhesive process is present in the middle ear. Unfortunately the number of post mortem examinations of cases with clear clinical histories with which to check them, have been so few in number as to leave the complicated or admixed cases in great obscurity, or, at least, in the field of empirical differential diagnosis. There remains a ray of hope, however, in the character of the tinnitus usually present in spongifying. Here the subjective noises

are more continuous and harassing. Even in cases with continuous harassing tinnitus, in which there are the visual evidences of adhesive processes in the middle ear, we cannot be quite sure that spongifying is also present, as tinnitus of this character is sometimes present in simple adhesive inflammation, especially if the foot-plate of the stapes is ankylosed. Any condition which causes fixation of the foot-plate of the stapes may be attended by continuous harassing tinnitus. This sign is, therefore, only presumptive and not conclusive evidence of spongifying. If, however, there is bewilderment and depression, together with continuous and annoying tinnitus, the presumption in favor of spongifying is strengthened.

The degree of deafness is rarely of value in determining the differential diagnosis, as it varies greatly in all forms of middle ear disease. It is less profound than the secreting variety, and may vary from slight to profound deafness in the adhesive and spongifying types. Profound or complete deafness is more common in spongifying. Deafness for speech is usually more pronounced than it is for music, except in those cases in which the labyrinth is also involved, and in these cases the hearing for music is lost.

Paracusis Willisii also fails to give positive information. It is rarely present in the secreting variety, rather common in adhesive otitis, and still more common in spongifying.

The functional tests of hearing afford some information as to the nature and location of the lesion, but a positive diagnosis cannot be made by their aid, except when taken in connection with all the other clinical phenomena. That is, cases of spongifying, complicated by adhesive otitis media cannot be differentiated clearly by the functional tests of hearing. If, however, the Eustachian tube is patulous and the drum-head is normal in appearance and the functional tests of hearing show a loss of hearing for tones of the lower register, a negative Rinné, and a prolonged hearing by bone conduction for the A fork, with but little loss of hearing for the tones of the upper register, the diagnosis of spongifying or rarifying osteitis of the bony capsule may be made with reasonable certainty.

In conclusion, it should be said that the question of the differential diagnosis of the chronic forms of non-suppurative otitis media will be comparatively easy in most cases if the following points are carefully considered during the examination of patients.

1. Bear in mind that in the present state of our knowledge of middle ear diseases there should be but three clinical subdivisions, namely:

- a. The moist or secreting type of otitis media.
- b. The adhesive or sclerotic otitis media.

c. Spongifying or rarifying osteitis of the bony capsule of the labyrinth.

2. Spongifying or rarifying osteitis of the bony capsule of the labyrinth is, essentially, a disease of the sound conduction apparatus, and should therefore, for purposes of clinical study, be classified with the middle ear diseases.

3. In uncomplicated cases of spongifying there are no objective signs of middle ear diseases. The drum-head is normal in appearance and the Eustachian tube is open. The functional tests of hearing give in a general way the same results as are obtained in other diseases of the conduction apparatus. In other words, the Eustachian tube and middle ear seem, upon an objective examination to be normal, while the functional tests show all the classical signs of what we were formerly pleased to call middle ear diseases. When, therefore, the objective signs of middle ear and Eustachian disease are absent and the functional examination with the forks and whistles show the conduction apparatus to be affected, it is a fair presumption that the case is one of spongifying or rarifying osteitis. The question of the differential diagnosis may be stated in still another way, namely:

When there is no apparent middle ear disease and the functional tests of hearing lead to the opposite conclusion, the case is one of spongifying. The functional tests usually give the following combination:

- a. Loss of hearing for the tones of the lower register.
- b. Increased hearing by bone conduction for fork A.
- c. Negative Rin  .

4. The moist or secreting type of otitis media may readily be diagnosed by the presence of the serous or sero-mucous fluid as seen through the lustrous drum-head, or as shown by auscultation and paracentesis. The functional examination gives about the same results as given under spongifying.

5. Adhesive otitis media may be diagnosed by the appearance of the fibrous bands through the thin, lustreless ground-glass drum-head, together with the calcareous deposits, irregular retraction of the drum-head, and the slight or transient improvement of hearing after inflation. The functional tests give about the same results as given under spongifying except in those cases in which the adhesive (sclerotic) process has extended to the contents of the labyrinth.

As a final word, I will say that the moist and adhesive types of otitis present characteristic changes in the drum-head, whereas, in simple spongifying, the drum-head is normal in appearance. The functional tests of hearing give approximately the same results in all three types of otitis, although in spongifying, the hearing by bone conduction, as shown by Fork A by Schwabach's method if often much prolonged.

THE TREATMENT OF CHRONIC NON-SUPPURATIVE OTITIS MEDIA.

BY M. A. GOLDSTEIN, M. D., ST. LOUIS, MO.

In order that a comprehensive outline in the therapy of chronic non-suppurative otitis media may be presented, an empirical subdivision of its stages and development may be offered as follows:

- I. *The Early Stages of Hypertrophic Catarrhal Otitis Media.*
- II. *Advanced Stages of Hypertrophic Catarrhal Otitis Media.*
- III. *Sclerosis and Rarefaction of the Bony Capsule of the Labyrinth.*

This arbitrary grouping affords us a means of considering measures for relief in the order of their importance and effectiveness. In this most common and intractable form of deafness, it is well to state that the earlier in the stage of the affection treatment is begun, the more prompt and effective will be the results. Much depends on a very careful diagnosis and differentiation of the form and stage of the disease in order that properly selected treatment may be conducted. It is not sufficient simply to establish the fact that the patient has a chronic middle ear catarrh, but to consider every factor which may contribute pathologically and mechanically to the affection. Thus for example, it would be useless to employ repeated Politzerization of an affected ear if there was complete occlusion of the Eustachian tube, either of its pharyngeal orifice or at the isthmus tubæ; it would be also contra-indicated to continue any line of treatment whether inflation, catheterization, intra-tympanic injection, the use of the bougie and the several forms of massage, if it can be distinctly demonstrated that frequent application of such treatment aggravates the case by increasing the deafness, intensifying the tinnitus and accentuating the vertigo. Each case therefore after careful examination, must have its course of treatment planned to best cope with the factors responsible for the affection.

1. *Early Stages of Hypertrophic Catarrhal Otitis Media.* As the nose and naso-pharynx constitute the basis in the pathology of this form of chronic catarrhal otitis media, our most careful attention should be given to the treatment of this area. The engorged, turgescient, and later, hypertrophied mucosa of this tract, is intimately associated with similar manifestations in the mucosa of the tympanic cavity and Eustachian tube. When this turgescence is sufficiently marked to materially diminish or entirely obstruct the lumen of the tubal canal, marked retraction of the membrana tympani ensues. If this retraction continues, and a plastic exudate is

thrown out from the engorged mucosa, the foundation for the formation of adhesions and ossicular ankylosis is laid.

Our first step therefore is to treat the turgescient mucosa. For this, no remedy at our command has proven as effective as adrenalin. Even though the contraction of tissue by the use of adrenalin chloride is temporary, it gives us the necessary opportunity to thoroughly inflate the middle ear, and the increase in the calibre of the tubal canal allows the exudate in the cavum tympanum to thoroughly drain. A recent retraction of the membrana tympani will usually yield to a few inflations of the tympanum either by Politzer bag or catheter. In each instance where inflation is used, the membrana tympani should be carefully inspected at every sitting, before and after inflation, and each change in the hearing distance of the affected ear and the plane of the membrana tympani carefully noted. When exudation is profuse in the tympanic cavity and is not readily drained in this simple way, incision of the membrana tympani may be required. The alkaline nasal spray and saline post nasal irrigation are sometimes effective in toning down the turgescient mucosa. I discourage the use of the nasal douche not only by the patient, but by the physician because of the possibility of unintentionally forcing the washing fluids and mucus into the tubal tract. Astringent applications are often of value in preventing recurrence of turgescence. Silver nitrate (forty grs. to the ounce) applied by cotton applicator through the nose to the naso-pharyngeal mouth of the Eustachian tube, often has a beneficial effect. Recently, silver salts which are less irritating and of better penetrating qualities, have been well indorsed as a substitute for the more irritating silver nitrate. Of these I have used protargol in from ten to twenty per cent watery solutions with good effect. The nebulizers and vapor treatment have their enthusiastic advocates. These vapors are used in connection either with the Politzer bag, catheter or mechanical vibrator, and the mucosa of the middle ear tract is thus brought in contact with the nebulized medicament. Campho-menthol, so long and favorably mentioned by Bishop, is generally used in five to ten per cent solution, in hydrocarbon oil. I have always been an enthusiastic advocate of the hot unguentum petrolatum spray, used in this class of cases with a five per cent campho-menthol solution, and rendered slightly astringent by a drop or two of *Ol. rosæ gerani*. My usual treatment therefore, consists:

(a) Applying a solution of adrenalin chloride (1-1000) by means of cotton applicator.

(b) Inflating Eustachian tube and tympanic cavity by Politzer bag, catheter or nebulizer.

(c) Swabbing the pharyngeal orifice of Eustachian tube and the turgescient mucosa of the nasal tract daily or on alternate days, with an aqueous five to ten per cent solution of protargol.

(d) Spraying the nasal cavity anteriorly and post-nasally with hot campho-menthol vaseline.

(e) To facilitate absorption of exudate in the tympanic cavity, and to restore the membrana tympani to its normal plane, I use aural massage of very mild character, and preferably by hand masseur.

Massage in this class of cases should not be continuous in character, but should be of about one-half minute in duration and should consist mechanically of gentle suction to aid the newly ærated tympanic cavity, to restore the membrana tympani to its normal plane. The long continued massage with rapid stroke of piston and frequent congestion of cavum tympanum is here contraindicated.

When this middle ear process is associated with a more advanced nasal pathology, and when hypertrophied turbinals interfere either with proper nasal respiration or with æration of the Eustachian canal, surgical intervention is called for. Septal deflections or projections and neoplasms obstructing the nasal passages, hypertrophied faucial or pharyngeal tonsils should all receive proper attention and should be removed early in the course of the treatment.

As diathesis is often an important factor in the etiology of chronic catarrhal otitis media, the general condition of the patient should be given careful consideration. Rheumatism, syphilis, tuberculosis, whether acquired or hereditary, have a frequent bearing on these cases, and tonics, alteratives or other systemic medications are often indicated. It may be necessary to advise change of employment for these patients, as certain occupations especially predispose to the development of these catarrhal affections. This is very marked among railroad employes and artisans who work in irritating atmospheres, such as millers, sawyers, grinders, etc. It is also interesting to note another class among who may be mentioned, bakers, moulders, stokers, etc., whose nasal and aural mucosa is affected by sudden thermal changes.

I have mentioned some of these data not because they form a part of the systematic line of treatment prescribed for the bulk of these cases, but to emphasize the importance of the general treatment of the case and the necessity for removing some of the remote causes of this affection.

If treatment is begun promptly, and if both the local and general conditions are given careful attention, the prognosis in this early stage of chronic catarrhal otitis media is always favorable.

II. *Advanced Stages of Chronic Catarrhal Otitis Media.* Under this subdivision we include long-standing plastic exudations and adhesions in the tympanic cavity, retraction of the membrana tympani and fixation of ossicles. In this advanced stage of catarrhal processes, hypertrophic changes have usually taken place both in the nasal passages and in the tubal and tympanic areas. The turbinal tissues obstruct the calibre of the nares; the hypertrophied mucosa reduces the lumen of the Eustachian canal; the plastic exudate, partially dried, binds down the membrana tympani and ossicles. These are the pathological results in this stage of chronic aural catarrh, and are the problems which confront us and to which we direct our mechanical and therapeutic measures. Inflation is an important consideration; the Politzer bag and catheter were the sheet anchor of the aurist several decades ago, before the introduction of the many forms of aural massage and other devices to attack the membrana tympani and ossicles from without. It is rational to assume that no matter what means may be employed to loosen adhesions either of the ossicles or membrana tympani, permanent improvement cannot be obtained unless the exciting cause, i. e., the thickened mucosa of the nasal, post-nasal or Eustachian tract is successfully dealt with. Inflation should be regularly practiced either daily or on alternate days, for a period of five or six weeks if necessary. Where the use of the catheter indicates that the lumen of the Eustachian tube has been impaired, excellent results may frequently be obtained by the occasional introduction of the whalebone bougie. From my own experience and observations, I would conclude that the Eustachian bougie is of inestimable value in the treatment of this class of cases, not only where there is a decided stricture of the Eustachian tube, but also where the lumen of the tubal canal indicates a much diminished diameter. The bougie in this class of cases should be used systematically and regularly. A bougie of properly selected diameter should be passed the full length of the Eustachian tube, and left in position for a time varying from one to ten minutes. If the patient complains of continued pain while the bougie is in position, it should be immediately withdrawn. The first application of the bougie is usually the most uncomfortable to the patient. When the bougie is withdrawn, and if there are no contra-indications, thorough inflation of the tympanic cavity should follow.

Repeat the introduction of the bougie about twice each week unless unfavorable reaction is noticed. Unless the patient cannot tolerate it, the next larger size bougie may be used, and this plan may be continued and the tubal canal subjected to a gradual dilatation

until the diameter of the affected tube is slightly larger than the lumen of the average normal Eustachian tube.

Of the contra-indications for the continued use of the bougie, perhaps the most frequent are a feeling of fullness and dullness in the ear, and an increase in the subjective symptoms.

Of course, the main element of value in the use of the bougie is a mechanical one, and the improvement noticed after its application is due to a clearing and dilatation of the Eustachian tube. The massage of the mucosa and musculature of the Eustachian tube and its stimulating effect both on the circulation and on the peripheral nerve endings, in loco and reflex, is another valuable factor.

As to the gold electrolytic bougie, I believe the addition of the mild galvanic current with its stimulating effect on the mucous membrane, nerves and muscles of the Eustachian tube, enhances the value of the bougie; but as to its mechanical and electrolytic results, I am not so sanguine, and can see no advantage from it over that to be derived from an intelligent use of the whalebone bougie.

The most interesting development in the mechanical treatment of chronic middle ear catarrh has undoubtedly been the introduction of massage of the drum membrane and ossicles in its manifold forms. Beginning with the Siegle otoscope and Delstanche masseur, there has been an interesting evolution to the present complicated electric aural massage pump, and the creditable efforts of Jackson, Ostmann, Pyncheon and others have received due appreciation. Luce claims a radical modification in massage treatment by the use of his cleverly constructed pressure probe, whereby the ossicular chain is brought directly into action along its physiological axis.

It is scarcely the province of this paper to discuss the many details of the several forms of massage technique and their advantages and disadvantages. Suffice it to say as far as my own experience is concerned, that I have not been able to ascertain better results from the use of the several complicated machine masseurs than by the use of the simple hand piston pump and pneumatic speculum. Adhesions which are so firm and tough that they will not yield to the hand masseur, are usually not benefited by any other or more complicated machinery, and require perhaps more radical treatment. Recent fixation of the ossicles and slight adhesions may be broken up by repeated massage either with a hand-masseur or with the electric massage pump; long-standing adhesions often resist every form of mechanical massage. Of the operative treatment which may be favorably considered in these cases, tenotomy and intra-tympanic severing of such adhesions is the only one which has partly stood the test of time. Excision of the ossicles in ankylosis has been

frequently advocated, but the favorably reported results have been temporary, as new cicatrization and fixation generally follows in the wake of such technique. The medications to the aural tract to which I have shown partiality in this class of cases. I would especially mention a ten per cent solution of campho-menthol in benzoïnol, a few drops of which may be injected through the Eustachian catheter and forced by compressed air into the tympanic cavity. I have also used iodine, carbolic acid and glycerine in a similar manner. In fact, I have endeavored to treat the mucosa of the tympanum and Eustachian tube in about the same way that I would treat the mucosa of the nares, the only difference being the difficulty in making applications direct to these affected areas.

Internal therapeutics in this stage are of but little value. Climatic conditions often materially influence the progress of chronic middle ear catarrh. The prognosis depends on the degree of deafness and on the ability of the individual case to respond to well-planned systematic treatment.

III. *Oto-Sclerosis*. In a definitely diagnosed case of oto-sclerosis, it is well to advise the patient that our progressive science and research has thus far been unable to suggest a beneficial form of treatment.

Too much emphasis cannot be laid on the necessity of a careful differentiation between the hypertrophic and the sclerotic forms of otitis media chronica catarrhalis.

DISCUSSION ON PAPERS OF DRS. W. L. BALLENGER AND M. A. GOLDSTEIN.

Dr. W. SOHIER BRYANT (New York). The authors of these papers deserve much praise for the way in which they have handled this most difficult subject. Dr. Ballenger in his classification certainly covers all cases, but possibly owing to the great importance which diagnosis holds in reference to the treatment of these cases, a little finer division than was given would be useful. Because under the head of chronic non-suppurative otitis media, especially in the adhesive division, a great variety of different conditions exist, among them calcification, atrophy, hypertrophy and adhesions proper, besides the faulty conditions of the Eustachian tube which are chiefly vascular, each requires a different method of treatment. Undoubtedly most of the treatment is empirical, but we cannot afford to lose any rational means we may possess because of the extreme obstinacy of these conditions.

Dr. Goldstein's system is certainly very complete, and covers all the newest things in this line. My own treatment is confined pri-

marily to the Eustachian tube, and as soon as this has been attended to to the best of my ability, then the structures within the drum receive attention. The Eustachian tube, it seems to me, should be made patulous, and after that Nature does much to improve the condition of the ear. Adhesions can be stretched by inflations and massage. In treatment of the Eustachian tube I have found the best results followed the use of adrenalin or some preparation of the suprarenal gland, followed by a counter irritant applied to the mouth of the tube and its neighborhood. The best agent has appeared to be Monsel's solution of the per sulphide of iron, or nitrate of silver. After the tube is sufficiently patulous to allow the passage of air during deglutition, the next thing to do is to improve any adhesive condition that may be present. In order to do this, irritating injections are often useful. Occasionally exceedingly favorable results follow a mild intercurrent acute otitis media, as in the case Dr. Reynolds told me of yesterday, and in a case of my own, where excellent hearing resulted in a case of long standing deafness. The treatment of secretory cases is easy and satisfactory. All that is needed is a patulous tube and the ear will drain itself. Constitutional treatment is most important in all cases, and gives good results if undertaken in the early stages of the disease, but the patient must be warned not to desist too soon. In the third division of Dr. Ballenger's classification the diagnosis is a little obscure, not to say difficult in the early stages of the condition. Many cases which might be classified in this group will recover after treatment directed against the adhesive condition. For this reason it seems to be good practice to treat all cases that fall under group three for adhesive disturbances, and give the patient the benefit of the doubt until trial has demonstrated the futility of the treatment, for the majority of these cases can be improved. I have seen many cases where the stapes has been removed, one especially in Dr. F. L. Jack's clinic showed very good results, the hearing being very much improved; but the improvement gradually decreased but did not entirely disappear. In the majority of the cases there were no good results.

Dr. E. PYNCHON (Chicago). We certainly are to be congratulated on having had two such valuable papers. I can not add anything to Dr. Ballenger's paper in his elaborate consideration of the subject with which his paper dealt. As regards treatment, Dr. Goldstein suggested hand massage in certain cases wherein there is a marked condition of drum head thickening and spoke in favor of hand massage in preference to mechanical massage. In my paper published some time ago I have taken the same ground and recommended Dr.

Bishop's pneumatic hand masseur. While Dr. Ballenger has given those many nice differentiations, the fact is that most cases as met with are mixed and not distinct, the Eustachian tube as well as the middle ear being almost invariably affected, and the hearing alternately better and worse. The condition of the mucous membrane in the tube is generally dependent upon abnormalities in the nose and throat and particularly the condition of semi-obstruction of the nasal passages, wherein the course of the air current is deviated so that it strikes certain points more than it should, being manifested by an increased redness of the nasal mucous membrane. All of these cases right through, if we will only except those cases which are purely and entirely labyrinthal, can be benefited by treating the nose if there is any abnormality present, in which case steps taken to bring the nose to an ideal standard will have a beneficial effect upon the ears.

Dr. S. H. LARGE (Cleveland, O.). I wish to ask Dr. Goldstein if he has had any experience with hot water in these hypertrophied conditions. Dr. Head read an article at Atlantic City on its use and advocated it strongly. I have been using an improvement on Luce's instrument called Lester's Electric Pressure Sound. The temporary results in some cases were marked but were not lasting.

Dr. ROBT. LEVY (Denver). The general tone of this discussion, not so much of the papers, gives us hope in these cases. I believe if we will look down into the innermost recesses of our hearts we will not feel as hopeful as we are led to believe by the discussion, and I am glad to have a little stimulation in the direction of doing more than has been done before. We are benefited by this optimistic view. The keynote is our ability to make a proper diagnosis of the variety of middle ear disease with which we are dealing and the fact that the gentlemen discussing have given different classifications, and that every one who writes gives a different classification, should be a warning of the great difficulty we are put to in outlining the particular pathological condition we are called on to deal with. In regard to the treatment of the nose, etc., I have never been able to see why the removal of some intra-nasal or naso-pharyngeal condition would improve the middle ear in which distinct pathological changes have already taken place. How will you produce absorption of adhesions, etc., by treating anything that has been causative? The only benefit is to possibly prevent increase of the difficulty. The importance of this has been established but one should not forget the importance of the treatment of the ear itself.

If a bougie is introduced carefully and properly after inflation it does no harm. The bougie may so wound simply by denuding the

epithelium that it will give us immediate trouble if we inflate afterwards. I think this has occurred in the experience of nearly every body, no matter how expert. It is necessary to offer a word of warning against forcible inflation after the use of the bougie.

Dr. H. B. HITZ (Milwaukee). There is one phase of this condition that has not been touched upon to any extent, namely that "laxness" in the membrana tympani, mentioned by Dr. Andrews, which I consider of considerable importance as pointing towards a frequent and probable cause of non-suppurative conditions of the middle ear.

Dr. Levy has mentioned the value of early nasal treatment. I thoroughly concur with his view, particularly if the symptom of laxness of the membrana is demonstrated. Nasal obstruction, means more or less frequent effort at clearing the nose usually by snuffing backward, or violent explosive blowing, leading to alternate rarefaction and compression in the naso-pharynx, and often to violent inflation of the tympanum. This violent inflation, whether by nose blowing or too persistent politzerization tends to promote dilation of the Eustachian tube, which in many instances paves the way for subsequent tubal infection and a consequent stenosis. That this condition of tubal dilatation is frequently true can be demonstrated by using the diagnostic tube, and then by having the patient blow the nose or hawk in the usual fashion, the membrana can be heard to flap back and forth; very gentle politzerization gives the same result. I have had some of those patients in whom this condition was marked, but who then had no deafness, return to me at a later period to be treated for the most obstinate form of non-suppurative middle ear disease. It is also a curious fact that most people affected with hypertrophic rhinitis or nasal obstruction have a habit of swallowing at the moment of wiping the nose, the result being a repetition of the rarefaction in the naso-pharynx before mentioned. This may do no harm in a single instance, but repeated many times a day for months and years, is to my mind a most potent element in the causation of aural disturbance in many cases. Hence I believe firmly in the early removal of nasal obstruction, as a prophylactic measure, in the beginning of so-called catarrhal deafness.

Regarding the diagnosis of fixation of the stapes, or osteitic process at the round or oval window, one must not fail to recognize the value of the more prolonged negative Rinne for the lower-toned forks, to which, I think Habermann first called attention.

Dr. H. W. LOEB (St. Louis). The treatment of the nose is decidedly indicated when there is a process going on in the nose which operates continuously in the direction of the disease. The main thing

is that by removing the obstruction and the process in the nose, we prevent sub-acute and acute inflammations in the nose, which tend to increase the inflammation throughout. That is where the benefit of the treatment of the nose is to be derived, in addition to what can be derived from treating the process of the disease. I think iodide of potassium is sometimes of service.

Dr. JOSEPH BECK (Chicago). I believe both authors have been very much alike in their description of this condition. The diagnosis is aided by the use of the A. fork. It is a great aid. I wish to speak about the use of the bougie. Until recently I was of the opinion that I passed the bougie almost invariably. I used the salpingoscope, which I described last winter in the *Illinois Medical Journal*, to control the certainty of having passed the bougie, and found that in many instances the bougie was bent in the ostium tubæ and I believe if Dr. Goldstein and anyone else using bougies will use the salpingoscope, he will find that he does not pass the bougie nearly as often as he believes, and that result from the use of the bougies is more imaginary than real.

Dr. L. C. CLINE (Indianapolis, Ind.). We all recognize that the treatment of the nose and throat is the first thing we must attend to, and the second thing is to clear the system and the alimentary tract. I often give effervescent phosphate of soda, and get gratifying results with patients of the lithæmic type.

Dr. BALLENGER (closing). I have very little to say. Several in discussing the papers have shown hazy ideas as to the differential diagnosis. That is, their understanding is so hazy that in talking they do not make a distinction between the three or more classes. It is not profitable to talk about the treatment of these cases as a whole. Each should be studied by itself, and the treatments should be talked of as separate entities. So I infer that some further study would be of benefit to us. Dr. Bryant was very definite in his differentiation throughout his talk, while some others were less clear. It has been my observation for a few years past that in conversation with otologists we are more lax in our differentiation than we should be in talking about these various types of non-suppurative middle ear diseases. I do not believe we are yet ready to make the fine distinctions Dr. Bryant recommended. The condition he spoke of as relaxation should not be spoken of as a separate disease, but only a phase or complication that occurs in the course of other diseases. I believe there are several types of disease we cannot yet recognize. We can not always say whether it is hypertrophic.

hyperæmic, hyperplastic or something else, but we can more roughly classify them so as to answer very well for clinical purposes. At present I am not able to make the finer distinctions, except occasionally. A word in reference to the use of massage; as to the hand apparatus or the so-called "machine." For the purpose of breaking down adhesions, always use the hand machine, but in those cases in which you wish to change the nutrition of the middle ear, as mentioned by Dr. Pynchon, the machine is of special value. In these cases it is of advantage to use the short stroke and rapid vibrations for five or ten minutes at a time. Venous stasis is thus reduced. This also favors the lymphatic circulation, which supplies the nutrition to the cells. The "machine" is of little value in breaking down adhesions. It is of greater value in hyperæmia, and, perhaps, in hypertrophy when circulating and nutritional changes are needed.

Dr. GOLDSTEIN (closing). My paper presents simply a summary of actual results obtained by the persistent treatment of this class of stubborn cases of simple chronic catarrhal otitis media. My opinions are neither optimistic nor radical, but I maintain that by pegging away at some of these old cases where the differential diagnosis has carefully excluded rarefying and spongifying processes, that very satisfactory results will frequently be obtained.

The operative work on the nose in hypertrophic cases is not undertaken simply for the removal of mechanical obstructions; often when the Eustachian mucosa is affected, beneficial reaction will be obtained by intra-nasal operations. Complaints have been made concerning the bougie, and the ease and frequency with which the mucosa of the Eustachian tract is injured. I have experienced but little difficulty in the manipulation of the whalebone bougie. If the introduction be gentle and if the patient does not experience any direct pain, and if care be taken at the withdrawal of the bougie and the tip examined to see that no blood has been drawn, many of the difficulties complained of will be avoided. The salpingoscope kindly loaned me by Dr. Beck, may give us useful data concerning the pharyngeal end of the Eustachian tube, and may assist us materially in overcoming some of the obstacles in the technique of the bougie.

I have had no experience in the use of hot water, but refer to the extensive monograph of Lermoyez of Paris and Moure of Bordeaux, in their experimental work with hot air applications to the nasal passages.

I would recall to Dr. Cline that I mentioned the lithæmic diathesis in referring to constitutional conditions in my paper.

WHAT CONSTITUTES PROPER NASAL TREATMENT IN CHRONIC EAR DISEASES?

BY JOHN A. DONOVAN, BUTTE, MONT.

A patient, who recently had adhesions loosened in both ears under general anæsthesia, consulted me presenting letter from a prominent aurist, stating that with appropriate nasal treatment favorable results might be expected. This patient had also been treated some weeks in Vienna. Inspection revealed a septal spur too large to allow a catheter to pass. This case following several similar experiences suggested the title of this paper.

Universal as our literature is on the necessity of correcting nasal deformities, in practice the world over, today with the exception of comparatively few men, only the grossest deformities seem to receive attention no matter how severe the symptoms. Dr. E. Pynchon's paper before this society last year (*LARYNGOSCOPE*, July, '03) probably describes an ideal nose as nearly accurate as our knowledge will permit. Such discussions must ultimately lead rhinologists to accept a somewhat uniform standard of practice, which will redound much to the credit of this branch of surgery, much more to our patients.

From observation, I believe when there is a catarrhal inflammation in the middle ear resulting from, or associated with a similar condition of naso-pharynx, nothing short of an anatomically and physiologically perfect nose will suffice to permanently check the condition, providing the patient continues to reside under the same environments, which most people will do. There is no deformity, however small, but to some extent influences respiration. This, while the patient is under observation in the office, may be unimportant, yet under less favorable conditions as sudden change of temperature, moisture, altitude, recumbent position, indigestion, etc., this trifling obstruction, for the time being becomes a decided one. Though the effect of such irritation be but temporary in the nose, its frequent occurrence sooner or later sets up changes in the ears which do not subside so readily, till one following another becomes a chronic, continuous irritation in itself.

A prominent factor but little dwelt upon in the etiology of otitis is:—if any nasal obstruction exists, during inspiration there is in direct proportion to the obstruction a negative pressure produced in the naso-pharynx. This produces rarefaction in the middle ear and

collapsed ear drums. This same vacuum must produce a turgescient condition of the tubes, thus maintaining a pathological condition in the middle ear. That a lessened air pressure will produce this condition while there is no direct evidence of it in the respiration, may be demonstrated by the dullness of hearing produced in many while ascending considerable heights; many people especially after having their attention drawn to it will experience this condition in crossing the mountains on a train. Accustomed as I am to high altitudes, I always experience it when traveling. That this cannot be due to the change of pressure directly on the ear drums is shown by the fact, that if no other factor existed the pressure must be equal on both sides. The frequent cases of epistaxis and menorrhagia in those first moving to high altitudes prove the engorged condition of all mucous membranes. The changes in circulation alone are not sufficient to explain all the phenomena.

There remain few aurists who doubt or dispute the nose as an etiological factor in this condition; as practically all admit it, then how should it be treated. The excuse given for non-surgical interference is that many deformities produce no symptoms, which is true, but these people do not consult us for treatment. It is, therefore, of patients who have some symptoms, however mild, already existing of whom I speak; and I may add the milder the symptoms in the ear the more urgent and the better the results of immediate, thorough, radical treatment of the nasal condition. To quote from paper previously referred to, "As structural deformity of some kind will be found present in the noses of all, or nearly all who apply for relief from the nasal trouble, the rhinologist will do his patients the greatest amount of good by taking such steps as will cause the nasal passages to resume the conformation and patency of the ideal standard.

Probably the most frequent obstructions are septal spurs, usually small and opposite the anterior end of lower turbinate or may be situated any place. Small hypertrophies in this locality are so frequent they might almost be considered normal if it were not for the decided improvement often following their removal. Before adapting the method of retaining the mucous membrane, it was a question often whether to risk the removal of what on examination appears to be an inoffensive enlargement, but with this method though longer time is taken in operating, the reaction is so slight, pain so little, recovery so rapid and complete that there remains no reason for taking any chances of their producing further trouble.

One suggestion in regard to technic. After cleansing and cocaine-izing, the mucous membrane is elevated; a small spur may be quickly

removed with Freer's sharp cutting spud or dissecting knife or a burr, the larger ones with saw, trephine or chisel; in any event the subsequent use of the burr will remove any ragged edge and make a smooth surface to which the mucous membrane adheres and heals more readily. In deflected septum, possibly the submucous dissection is the ideal method, and especially so if complicated by much hypertrophy. A modification of Gleason's operation in most of cases has given me such good results, I feel loath to abandon it. I continue both upper ends of the incision, cutting entirely through the cartilage if possible, protecting the skin by raising it with thumb and finger of other hand. This makes a longer flap and completely destroys its resiliency. I use no plugs for after treatment at all, finding them not only unnecessary as a rule but objectionable. For enlargement of middle turbinate, the scissor and snare, and for lower turbinate the saw and scissor, removing only sufficient of the edge as described by C. R. Holmes (*N. Y. Med. Journ.*, Sept., '00) will complete either operation from a fraction of to a few minutes' time, especially if a mechanical saw be used. The De Vilbiss saw is small enough to engage, and will easily remove any portion of the lower turbinate in a few seconds. With motor and mechanical saw, the time and consequent pain, hemorrhage and fatigue experienced in cutting thick or hard bone anywhere is eliminated, thus simplyfying the operation.

With skill and practice any of these deformities can be corrected in a strictly surgical manner in but a few minutes' time longer and with as little pain and discomfort as would require for a single application of any of the less radical remedies. The risk and disagreeable results immediately following is of course greater, but the use of an adrenalin and resorcin spray to control hemorrhage, immediate application of orthoform powder to relieve pain and some form of menthol spray is less objectionable than the necessity for frequent irritating applications that at best have but a temporary effect.

The time to operate in most of these cases is at once. Except where there is positive danger of infection, the patient who is operated on before leaving the chair fares infinitely better than the one who takes days, weeks and more likely years to consider some dreadful operation to be performed. Assuming the patient has come for treatment and circumstances will permit of avoiding heavy manual labor a day or two should it be necessary, a few words of assurance, careful application of the anæsthetic, a skilled manipulation of the instruments completes the worst feature of the case. The patient gains confidence instead of fear and the after treatment or other operations are done without trouble or anxiety. Of course, in case

of immediate operation there must be no possibility of a doubt as to the procedure. Where doubt exists, then the case must be first studied. I doubt the utility of prolonged preparatory treatment to render a surface aseptic that of necessity must constantly be exposed to new sources of infection every moment. Also, any after treatment which prohibits the free escape of secretions is to be avoided when possible. In cases where systemic reaction has followed in my practice it has much more frequently been when I have used packing.

When it is necessary to attack soft tissue only, punctures with cautery point are preferable to the use of acids as a rule, being more easily handled and less painful. In every case it is individuals with whom we have to deal, not isolated portions of anatomy, so there can be no positive rule to which there are not many exceptions.

In conclusion, would suggest that when nasal treatment is indicated as a remedy to lessen or check middle ear inflammations nothing short of anatomically and physiologically perfect nasal chambers be aimed at. That those methods of procedure be recommended that will accomplish the most thorough and permanent results in the least possible time with proportionally the least danger. That unless there are positive indications to the contrary immediate surgical treatment should be advised and operations be repeated as often as considered safe till no obstruction remains, irrespective of size or number of obstructions present.

DISCUSSION.

Dr. EDWIN PYNCHON (Chicago). We have all been much entertained by this instructive paper, in which Dr. Donovan follows similar lines to those advanced by Snow, of Syracuse, and Fitzpatrick, of Hartford, in the treatment of ear troubles. The unfavorable bearing of mal-conditions of the nose upon the ear is partially from the systemic effect through the intestinal and pulmonary tracts. As I remarked this morning, the nasal mucous membrane, if in a perfect condition, should be of that pink color seen in the roof of the mouth, and if it is more red than it should be, there is generally a local source of irritation or some obstruction which should be removed, and any irritation is carried back so as to affect the Eustachian tube. Those small spurs on the septum are just as important to remove as the large ones. I compare the nasal obstruction to the condition of strabismus. If one eye is greatly diverted, the patient does not pay any attention to it except for cosmetic reasons, but with a small degree of insufficiency, when he is trying to see with both eyes, he has headache and diplopia. A mild degree of astigma-

tism will frequently produce more trouble than will a greater defect. If there is a marked deformity in the nose, the patient often gets used to the trouble and gets along fairly well, but with the little defects, where nature does not produce compensatory changes, there is a constant irritation. Next as regards what effect these corrections will have on ear trouble. When I have patients with impaired hearing, I learn first whether they hear better at one time than another. As sure as they say yes I find defects in the nose, and I always tell such patients that if we can get the defects out of the nose we can greatly improve or even cure the ear trouble. I often talk plainly when the hearing is impaired and tell them that they must not expect to be cured in a short time. I then start in on the nose and throat. Later on the pneumatic massage and other treatment is directed to the ear proper, but early in the game the treatment is nearly all directed to the nose and upper throat.

Dr. L. C. CLINE (Indianapolis, Ind.). I am sorry I did not hear the first part of the paper, but I commend the doctor on the clean-cut description of the operation, and especially on doing the operation where not contra-indicated, in the beginning. I have had experience in allowing the patient to go and think about the matter for a week or two, and tell all their friends and relations about the great operation they are going to undergo, and get all the advice they can in regard to it. The fear and damage that is done is more than any little shock they may get from the immediate operation. I like his method of doing the operation at once before letting the patient go home.

Dr. L. J. GOUX (Detroit, Mich.). My idea of the anatomically perfect nose has undergone considerable evolution. I believe a person may have a slight spur or deflection and still have an anatomically perfect nose providing the respiration is normal. I believe the nose and throat specialists make a mistake in operating some times on spurs which have no significance. If you try to find an anatomically perfect nose you will have to go a long ways to discover it. I believe the method suggested by the doctor in not packing the nose after the operation is good. I seldom do it. I sometimes use adrenalin in the operation, but we often have unpleasant consequences and I prefer to have the patient do the bleeding in the office and not afterwards.

Dr. DONOVAN (closing). The paper covers the matter of the anatomically perfect nose. The question is this: A patient comes to me having been operated on in New York, San Francisco and even

stopped over in Chicago; all have done operations, then I must do one before anyone else gets him. Most of these operations seem to have been necessary and proven beneficial. Then, why should not the first man have completed the job? Unless the packing is put in very tight to prevent hemorrhage it does more harm than good. You can check the hemorrhage with adrenalin during the operation, and let the patient take it home and spray two or three hours, repeating lightly every half hour if indicated and they will not have hemorrhage. I prescribe a drachm to the ounce for home use. I would not care to have my nose packed thoroughly except in case where the hemorrhage could not be controlled. The chief thing I want to emphasize is the necessity of curing the nose, and doing it at once, and doing it thoroughly.

TURBINECTOMY.

BY DUDLEY S. REYNOLDS, A.M., M.D.

The shape, the size, and the course of the passages and crypts of the nose, and its accessory sinuses and cells, are as variable as are any other individual features, and perhaps more so.

The relations of the inferior turbinate bodies to the superior passages, cavities, crypts, and sinuses of the nose, are always such as to limit, interfere with, or prevent free drainage from the spaces above. Deviations, ridges, and spurs of the septum, in contact with the inferior turbinate body, pressing into the space between the inferior and middle turbinates, against the middle turbinate, or as is sometimes the case, presenting irregular projections in two or more of these situations, may all be relieved by removing completely the inferior turbinate body.

Few septal ridges and spurs are attended by any inconvenience to the patient, unless they create obstructions to the free passage of air through the nose, as well as the free outlet of mucoid, or purulent discharges. Vegetations in the vault of the pharynx, and nasal polypi are the common results of such nasal obstructions as prevent free drainage of all cavities, crypts, and sinuses.

In many cases of adenoid vegetations in the vault of the pharynx instant relief to the distressing symptoms of obstructed nasal respiration, and ultimate shrinkage and disappearance of the adenoid vegetations themselves, follow complete turbinectomy.

In cases where the inferior turbinate bone projects far into the pharynx, adenoid vegetations are nearly always present, and the removal of the inferior turbinate body gives prompt relief to the distressing tinnitus and deafness usually present in such cases. This is the natural result of taking away the obstructions at the inferior extremity of the Eustachian tube, and allowing free circulation of air, as well as free drainage to the parts.

In cases of nasal polypi long continued obstruction from the swelling of the soft structures covering the bony walls, in close proximity, constitutes the cause; and it may be necessary, in order to prevent the recurrence of such growths, to take away not only the entire inferior turbinate body, but a considerable portion of the middle turbinate.

In my experience, the removal of septal ridges and spurs, where real obstructions exist from the proximity of the inferior turbinate

body to the floor of the nasal passages and the presence of adenoid growths behind it in the pharynx, accomplish no material relief, whilst removal of the inferior turbinate body alone secures a free outlet through the inferior nasal passages for all morbid accumulations in the spaces above, and what is equally important, it gives free circulation of air through the Eustachian tube, and the pharynx. I have never known occlusion of the inferior extremity of the lachrymal duct to follow this operation; per contra, I have frequently had patients who had long suffered with *stillicidium lachrymarium*, entirely relieved by inferior turbinectomy.

Now, a few words as to the mode of operating. Having blanched the membrane first by spraying it with a 1 to 1000 solution of chloride of adrenalin, and then by packing small bits of cotton wool saturated with this solution into the upper sinuses as far as possible, remove this packing, and replace it with portions of cotton wool saturated in a solution of cocaine, made by dissolving $\frac{1}{2}$ drachm of the muriate of cocaine in one ounce of distilled water. The cocaine packing should be put into all the available spaces in the side of the nose to be operated on, including a liberal supply beneath the inferior turbinate. This packing should reach the pharynx, if possible. Experience shows that not more than ten minutes, nor less than five should elapse between the time of introducing the cocaine and beginning the operation. The operation itself should always be done with a saw. I have found that even in cases of great deformity, where the curvature is as great as the quadrant of a circle, the saw can be bent around, and easily moved in the line of curvature.

To show the varying shapes of the inferior turbinate body I submit thirty-four specimens, taken at random. In many cases it has been necessary to divide the specimen with the bone scissors before attempting its removal through the anterior meatus. In fact it often happens that the inferior turbinate bone is much broader than the anterior meatus of the nose can give exit to. In some cases the base of attachment is thick and highly arched near the anterior extremity. In many instances the line of attachment is but slightly curved. In some the base of the inferior turbinate body is so thin that not more than three or four strokes of the saw are required to sever it. In others, the bone is so thick, so dense in structure as to resemble ivory in its resistance to the saw, and it is removed with great difficulty, requiring sometimes as much as three or four minutes to complete its division.

The size and conformation of the nose externally affords no suggestion as to the shape, size and structure of the inferior turbinate body within.

After the operation of turbinectomy it is best to use some form of pack, which should always be limited to the region of the operation itself, without extending, or attempting to introduce it above the inferior edge of the middle turbinate. Where it is possible to allow free respiration through the middle or superior passages, it is best to do so.

The very best form of pack is made by taking a quantity of cotton wool, and, rolling it in a little piece of gauze, just sufficient to cover it. Seizing this at one extremity with the ordinary small angular dressing forceps, it may be easily carried back to the pharynx, and with the forceps you may then press laterally so as to force it up into close contact with the wound along its whole extent. Usually this pack should be removed about 48 hours after the operation.

In those persons especially prone to bleed, the surgeon must use his own judgment and skill in restraining hemorrhage. I have found that a quantity of tannic acid, in the dry state, enclosed in the roll of cotton wool, of which the pack is made, answers the purpose in most cases. In a few, the administration of ten grains of gallic acid every hour or two has been found a necessary adjuvant to the local measures.

When the packing has been removed, which should always be done before any suppurative manifestations occur, some form of saline antiseptic spray should be employed. In those cases where there is no pus, or muco-pus, present at the time of operation, the best form of spray is this:

℞ Sodii Boratis ℥iiss
Sodii Chloridi ℥i
Aquæ Camphoræ
Aquæ Menthæ pip aa ℥viii

M. Ft. Solutio.

Sig: Use as a spray for the nose, every three hours.

In cases of chronic purulent infection, where it is impossible to thoroughly cleanse the passages before operating, the following mixture may be used, before applying the dressing and subsequent to its removal:

℞ Glyco Thymolini
Aquæ Menthæ pip aa ℥viii
Sodii Chloridi ℥i
Hydr. Bichloridi gr.ii

M. Ft. Solutio.

Sig: Use as a spray for the nose every two hours.

In conclusion, I feel constrained to say it is quite difficult to obtain good saws. In my judgement, the operator will need two kinds; one with fine teeth of uniform size, and one with coarser teeth, interrupted by spaces, or notches. The teeth should be cut at such angle as to permit the saw to do all its cutting by the pushing motion, and none by the movement of withdrawal. The blades should not be too narrow, one-eighth of an inch being about the correct width. The cutting edge of the saw should not be less than three inches in extent. The tip end of the saw should be well rounded and smooth, but not bulbous, because of the difficulty of withdrawing it from the groove made by its cutting edge. The back edge of the saw should be slightly thinner than the cutting edge, and the teeth should never be set, as in the wood-worker's saw. It is a question still sub judice with me, as to whether the teeth should be cut with their surfaces exactly at right angles to the long axis of the blade, or in an alternating, oblique direction like the wood saws.

The adjustable saws made for me by Dr. Allen DeVilbiss have served my purposes best. The blades, however, should not be so narrow as to permit them to bend easily, on pressure.

For cutting thick, hard bones, the coarse interrupted teeth do not clog so easily, and the cutting power of this form is greater.

For thin bones the smaller and more closely set teeth are most satisfactory. Dr. Seaton has recently devised a form of saw with isosceles-triangular teeth divided by cutting them directly through from apex to base, in a line perpendicular to the plane of the cutting edge, thus making two rectangular triangles in close proximity.

No.	Date.	Age.	Sex.	SYMPTOMS.	TREATMENT.	RESULTS.
1	1903 July	22	M.	Chronic muco-purulent discharge, asthma, tinnitus, impaired hearing.	Removed both inferior turbinates, Eustachian catheter occasionally spray.	Dr. R. continued spray, reported complete recovery 3 weeks.
2	"	20	M.	Obstruction, Chronic Catarrh.	Removed left inferior turbinate; antiseptic saline spray.	Recovery in 10 days.
3	"	21	M.	(Obstructed respiration, adenoids, septal ridges and spurs.	Removed both inferior turbinates; borate and chloride of sodium spray.	Recovery in 3 weeks.
4	Aug.	34	M.	Complete obstruction both sides; asthma, adenoids, septal ridges.	Removed both inferior turbinates; used borate of sodium spray.	Complete recovery in 10 days.
5	"	7	M.	Obstruction, adenoids, asthma, tinnitus, impaired hearing.	Inferior turbinectomy, right side.	Recovery in one week.
6	"	25	M.	Nearly complete obstruction, tinnitus, impaired hearing.	Removed right inferior turbinate.	Died 48 hrs afterward with congestive chill.
7	"	41	F.	Obstruction nearly complete, asthma, tinnitus, adenoids.	Removed right inferior turbinate; used saline spray.	Greatly relieved, discharged in one month.
8	Sept.	22	M.	Mouth breather, tinnitus, impaired hearing, adenoids.	Removed left inferior turbinate; saline spray.	Entire recovery in 4 weeks.
9	"	25	M.	Asthma, nasal obstruction, septal ridges and spurs, tinnitus.	Removed right inferior turbinate; borate and chloride sodium spray.	Complete recovery in 3 weeks.
10	"	26	M.	Obstruction, coryza, adenoids.	Removed right inferior turbinate.	Entire recovery in 8 days.
11	Oct.	5	M.	Nearly complete obstruction, frontal headache, tinnitus.	Removed both inferior turbinates.	Complete recovery in 6 weeks.
12	"	51	M.	Chronic catarrh, headache, coryza, adenoids.	Removed right inferior turbinate; bichloride spray.	Recovery in 14 days.
13	"	26	F.	Nasal obstruction, septal ridges, coryza, adenoids.	Removed left inferior turbinate.	Complete recovery in 20 days.
14	"	28	F.	Frontal headache, coryza, tinnitus, impaired hearing.	Removed right inferior turbinate, saline spray.	Complete recovery in 4 weeks.
15	Nov.	11	F.	Complete nasal obstruction, septal ridge, otitis, impaired hearing.	Removed right inferior turbinate; spray.	Complete recovery in 5 weeks.
16	"	14	F.	Complete obstruction, adenoids, otitis media of 12 years standing.	Removed left inferior turbinate; saline spray.	Complete recovery in 28 days.
17	"	21	F.	Complete obstruction, adenoids, otitis media of 12 years standing.	Removed right inferior turbinate; Same patient.	Complete recovery in 4 months, restoration of hearing.
18	"	21	M.	Complete obstruction, polypi left side, otitis media right side, impaired hearing.	Removed both inferior turbinates and large fibroid from left side; spray and catheter.	Almost complete recovery in 8 days.
19	"	23	M.	Obstruction, septal ridges, impaired hearing, tinnitus.	Removed left inferior turbinate; catheter and spray.	Complete recovery in 4 months.
20	1904 Jan'y.	11	F.	Complete nasal obstruction both sides; otitis media right side, 10 years.	Removed both inferior turbinates, disclosing adenoids and septal ridges.	Recovery in 5 weeks.
21	"	26	M.	Complete nasal obstruction both sides; impaired hearing, tinnitus, etc.	Removed right inferior turbinate; bichloride spray.	Complete recovery in 3 weeks.
22	"	25	M.	Complete nasal obstruction both sides; impaired hearing, tinnitus, etc.	Removed left inferior turbinate; bichloride spray.	Complete recovery in 14 days.
23	Feb'y.	1	M.	Complete nasal obstruction both sides; tinnitus, impaired hearing.	Removed both inferior turbinates, spray.	Complete recovery in 5 weeks.
24	"	38	F.	Obstruction, coryza, chronic catarrh.	Removed both inferior turbinates.	Complete recovery in 3 weeks.
25	March	13	F.	(Complete obstruction, septal ridge, adenoids, impaired hearing.	Removed both inferior turbinates.	Complete recovery in 14 days.
26	"	1	F.	Nearly complete obstruction; tinnitus, asthma.	Removed both inferior turbinates; bichloride spray.	Complete recovery in 5 weeks.
27	"	4	F.	Nearly complete obstruction; adenoids, coryza, tinnitus.	Removed both inferior turbinates; borate and chloride sodium spray.	Complete recovery in 4 weeks.
28	"	14	F.	Complete obstruction; septal ridge, adenoids, impaired hearing.	Removed right inferior turbinate; saline spray.	Complete recovery in 10 days.
29	"	13	F.	Complete obstruction, right side, chronic catarrh.	Removed right inferior turbinate; spray.	Complete recovery in 4 weeks.
30	"	20	M.	Nearly complete obstruction; chronic catarrh, otitis media, has had mastoid operation.	Removed left inferior turbinate; bichloride spray and local treatment of ear.	Complete recovery in 3 weeks.
31	April	4	M.	Obstruction, septal ridge, adenoids.	Removed both inferior turbinates.	Complete recovery in 2 months.
32	May	18	M.	Complete obstruction left side; septal ridge, chronic catarrh.	Removed left inferior turbinate.	Complete recovery in 8 days.
33	"	20	M.	Nasal obstruction, septal ridge, asthma, tinnitus.	Removed both inferior turbinates; saline spray.	Obstruction and tinnitus relieved in 8 days.
34	"	22	F.	Chronic catarrh, obstruction nearly complete, asthma.	Removed left inferior turbinate; saline spray.	Complete recovery in 2 months.
35	"	30	F.	Complete obstruction left side; polypoids, epiphora of long standing.	Removed left inferior turbinate and polypi; saline spray.	Complete recovery in 5 weeks.

N. B. This table explains the cases from whom the specimens submitted were taken.

DISCUSSION.

Dr. M. A. GOLDSTEIN (St. Louis). In view of the very remarkable results reported by Dr. Reynolds in the majority of his cases, and the rather mediocre ones that some of us have had in many similar cases, it is difficult to determine what the cause of this great difference of opinion may be.

In the first place, the description of the cases reported by Dr. Reynolds should be more definite, especially as to the unusually favorable prognosis. Then again in many of these cases he has detailed the presence of large quantities of tissue, and states that as a result of the intra-nasal operations which he performed, absorption of the adenoid tissue took place. He also refers to several cases of chronic catarrhal otitis media complicated with hypertrophied turbinal tissues, and states that after the removal of the turbinates, rapid improvement of the aural affection ensued. What we should especially like to know in these cases of adenoid and aural complications is "have the adenoids been absorbed and the ear conditions vastly improved as stated in these reports simply as the result of the turbinectomy?"

Dr. LOCKARD. I think the entire principle advocated in this paper is wrong and pernicious. It is wrong and unnecessary, because perfect respiration can be obtained with less extreme measures. Normal respiration can be gotten by the removal of the inferior edge of the turbinate, taking a small sliver of the bone, which leaves a permanent scar. I think complete turbinectomy is based on a pernicious principle from the fact that it is almost certain to result in atrophy. These cases will later have a dry condition, particularly of the nasopharynx, which is most annoying.

Dr. BULLARD. I would suggest that if Dr. Reynolds will keep watch of these cases for five years and then report, he will not advocate such radical work. He says that the cases which have adenoids seem to be cured. I think the adenoids are dessicated, dried up as it were, by the want of moisture in the inhaled air.

Dr. BUCKWALTER. The majority of us do not operate enough in the nose. We do not remove enough tissue; but looking at the specimens here, it seems as though the other extreme prevailed and you will notice on the posterior portion of each, a sponge-like tissue, evidence of posterior hypertrophy. The reason a great many of us fail to get relief from ear affections and free nasal respiration, is because we do not remove this posterior hypertrophy. Often in my practice patients will say they can breathe perfectly yet one can see

far back the posterior hypertrophy hanging down, and with a probe can push it upward and forward into the meatus. Dr. Reynolds, as his specimens show, removes this hypertrophy. I have been able to remove it without taking all the inferior turbinal body. I use a strong snare, and after doing a partial turbinectomy put the snare well back and having it at an obtuse angle at the juncture, place it over the posterior hypertrophy. Frequently after delivering the obstruction the hypertrophy is as large as the tip of the little finger, or larger. Of course when we apply cocaine or spray adrenalin it shrinks, but in the pathological state it is as large as stated.

Dr. DONOVAN. After just having advocated the thorough surgical treatment of all deformities, I would be willing to have any operation, which I have described, performed on my nose by any competent man, but not under any condition would I be willing to have this done.

Dr. LARGE. There would be great danger of the patient developing a pharyngitis and laryngitis on account of the cold air passing through the open nares.

The doctor does not say what would have been the results if he had removed the adenoids, polypi, and enlarged tonsils, instead of doing a turbinectomy.

Dr. H. W. LOEB (St. Louis). I consider the removal of the turbinate to this extent one of the most serious operations which we are called upon to do. I know it is called for at times, but I am thankful to say it has been called for seldom in my practice. I should weigh the chances of the results, not so much in so far as the immediate results are concerned, but as regards future troubles. It will give ample room for respiration through the nose, but I deny it gives ample nasal respiration, because that means proper heat and moisture of the air passing through the nose. If you take out the turbinate you cannot get it. We should be careful in regard to this, no matter how much or how little of this turbinate is removed. I have seen noses designated as cured by taking out the turbinate bone, and years afterwards not only had they the same troubles again, but there were other troubles which were vastly worse. I am glad indeed that I have not thirty-four turbinates to charge against my account.

Dr. POPE FARRINGTON (Memphis, Tenn.). I have had quite a personal experience with this operation, having had both my lower turbinates removed five years ago. They were much hypertrophied and met the septum on both sides. However, I cannot agree that the entire turbinate should be removed. My experience is that we

may suffer with a pharyngitis after this operation following sudden changes of temperature. The air passing through too freely has not the moisture which it should have, and I attribute these acute attacks to this condition. It has been my practice to take a middle ground in this operation and remove only the dependent portions of the turbinate.

I find that such an operation relieves all symptoms complained of and still leaves a sufficient amount of mucous surface from which the air may get the proper amount of moisture.

Dr. H. B. HIRTZ (Milwaukee). Some years ago on my return from abroad I brought a Carmalt Jones spokeshave and for a while performed many very neat operations of this character. But I gradually came to the conclusion that the operation was crude and unscientific, and that more satisfactory results could be obtained by more rational methods, such for example as the view expressed by Dr. Lockard of removing the lower margin of the inferior turbinate, or the operation of Dundas Grant, of removing a triangular portion from the anterior end of the inferior turbinal body, thereby allowing free circulation of air under this organ.

Dr. D. T. VAIL. I wish to say that we, as a scientific body, should call things by their right names. I see Dr. Reynolds has called his operation by the right name, but the operation we most of us do should be called *partial turbinectomy*.

We do partial turbinectomy for two reasons: namely, to improve respiration and benefit aural conditions. In the former the operation should be limited pretty much to the anterior half of the turbinate, removing the edge of the bone and overlying tissues. In the latter the operation should be done on the posterior two-thirds of the turbinate with the endeavor to get the posterior hypertrophy. The air can pass around the front third of the turbinate and the patient will have no trouble with nasal respiration and no chronic pharyngitis, and the results as regards the ear will be as good as those mentioned by the essayist.

Dr. KYLE. Dr. Reynolds has conferred a great favor on the society to the extent at least that we will be able to follow the effects of this operation in a great many cases. I have never seen atrophy of the mucosa following a surgical operation on the nose. I shall watch Dr. Reynolds results in the future with great interest.

Dr. A. H. ANDREWS. According to my observation, I have felt that the removal of a portion of the inferior turbinate, at least in a majority of cases, gives room for all the air to pass that could get

into the anterior meatus. I have been much interested in the report, as evidently the rest have been; and I am willing to wait a while, and even to make some experiments along this same line, with the consent of my patients, in order to determine for myself the result of this operation. I am hardly ready to condemn it as completely as many of the physicians here have done.

Dr. BECK. I have not the least doubt about Dr. Reynolds' results. I believe everything he says is true. We have all read of late a good deal and been lead to believe that nasal polypi were not due to enlargement of the turbinate bodies, but to diseases of the sinuses. I also believe that if the middle turbinal body had been removed instead of the inferior, respiration would have been better and many of his cases of nasal polypi would have been better attacked.

Dr. PYNCHON. Harris of New York also reports this operation with beneficial results. In several of these cases reported by Dr. Reynolds, my preference would have been to remove the deformity upon the septum. To do a turbinectomy so as to leave too large a space, interferes with the proper ventilation of the nose, because it allows the air to go through in too large a stream. I do not see how removal of the inferior turbinate is going to cure nasal polypi which have been dependent upon the ethmoid disease, but I do think in these cases a considerable portion of the middle turbinate should be removed. You will get a tendency to atrophy by removing too much of the inferior body.

Dr. PARKER. I had an experience with complete turbinectomy. It had been done two years and troubled me more than any other I have had in my life. Pharyngitis started up frequently and could not be relieved. I got no relief as long as the man lived—he was killed—for he was always after me because I did not cure him.

Dr. REYNOLDS (closing discussion). I am quite delighted with the discussion. I put my paper in the form I did for the purpose of bringing out discussion. Dr. Goldstein wants to know how adenoids disappear, and what are the ear conditions. The adenoids, perhaps, do not entirely disappear, but they undergo shrinkage and in many cases there is great improvement, particularly in cases of obstruction of the Eustachian tube. In case of narrow nasal passages, very little swelling closes the upper passages, and the lower being blocked by the large turbinal body, or the projection of septal ridges, or being so low as to come in contact with the floor of the passage, I think the only right or rational treatment is to take out the entire turbinate. As to the amount of experience I have had in the operation, it has

extended through many years. The first I did was in a case upon which I had operated on the same side of the nose taking away part of the bone. When I took out the entire inferior turbinal body the patient was relieved. This was in 1885. I know that gentleman has had no trouble since, and prior to that time he had been a very constant patron of confreres as well as of myself.

Dr. Lockard thinks it pernicious practice and would prefer the obstruction to the atrophy. I would like him to explain what atrophy he means. It creates no atrophy. The wound is along the border of the inferior turbinate at its attachment to the perpendicular wall of the palate bone and there can be no atrophy, except of the cicatricial tissues along the line of division.

Dr. Bullard thinks all cases should be followed for at least five years. A great many cases I did follow up for more than five years, and the results were so gratifying that I determined in all cases of obstruction where it was distinctly apparent that the chief offending body was the inferior turbinal, to take it all out, as otherwise there is liable to be such a swelling as to re-establish the blockade.

Dr. Buckwalter thinks the operation too radical and would use a snare. Permit me to differ from his opinion. I could not accept the statement that he removed the projecting end of the inferior turbinate with a snare. If he will undertake to saw it he will often find it as hard as ivory and $\frac{3}{8}$ inch thick.

Dr. Donovan under no circumstances would permit the operation on himself. He does not understand the operation, and he has not conversed with the patients who have had it done. If he will come down to see them, or permit me to send some of my traveling men to his office, he will change his opinion.

Dr. Large says it produces, or tends to produce laryngitis. I do not believe that at all. The infection in the atmosphere may cause laryngitis whether nasal obstruction exists or not. In all cases of nasal polypi the object in removing the inferior turbinal body is to get drainage and afford a free outlet to the fluids from above. The passages being narrow, when swelling takes place they are closed, and the inferior turbinal body keeps up the obstruction, and maintains the contact between the opposite walls, abrasions occur and granulation takes place, and a polypoid growth is the result. No permanent relief can follow the removal of the polyp merely, as the same conditions which produced it still remain. Remove the entire inferior turbinate and drainage will prevent closure of the passages above.

THE TYMPANO-MASTOID OPERATION IN CHRONIC SUPPURATIVE OTITIS MEDIA.

BY ALBERT H. ANDREWS, M.D., CHICAGO.

In talking with those who treat the ear and in looking over the literature of suppurative otitis media one is impressed with the number of different plans of treatment recommended and the great variety of medicinal agents in the success of which their respective advocates seem to have implicit confidence. That many cases of chronic suppuration even of long duration, are cured by these so-called conservative methods is well known to all. That many cases have been treated by such methods for a long period of time and still continue to discharge, is equally well known. The great majority of cases found in the latter class undoubtedly accounts for the belief found both among the laity and among physicians that little or nothing can be done for discharging ears. When a patient with a chronic suppurating ear applies for treatment the first question to decide is not what remedy to use but whether this is a case for conservative or surgical treatment.

As our diagnostic ability increases our reputations will suffer less from unsuccessful attempts to cure surgical cases by non-surgical means. In the present state of our knowledge it is not always possible to determine at the first examination in which class a given case belongs.

The pathologic conditions which nature cannot be expected to correct without the help of the surgeon may be enumerated as follows: 1. Bone necrosis either in the ossicles, attic, antrum, or mastoid. 2. Granulations or polypi within the deeper cavities of the middle ear. 3. Osteosclerosis of the mastoid. 4. A lining of the deeper cavities of the middle ear with epidermis either with or without cholesteatoma. Sometimes only one of these conditions is present; again all may be found in a single case. Sometimes the surgical cause of the suppuration is easy and sometimes difficult of recognition. When a surgical cause for the continued suppuration cannot be discovered it is perfectly proper to treat the case conservatively until it is cured, or until it becomes apparent that there is some condition present which will require radical measures.

The treatment of chronic suppurative otitis media may be classified as: 1. Mechanical, including attempts at cleansing and drain-

age of the cavities of the middle ear. 2. The use of medicinal agents supposed to have germicidal or healing properties. 3. The use of internal remedies either for building up the general health of the patient or for their more direct effect upon the suppurative process. 4. The surgical treatment which includes the removal of granulations or polypi from the auditory canal and middle ear, enlarging the perforation to secure better drainage, ossiculectomy, the removal of the plate of bone between the attic and the inner end of the auditory canal, and the radical or tympano-mastoid operation.

As distinguished from the ordinary mastoid operation the tympano-mastoid includes not only a clearing away of all diseased tissue within the mastoid process but the removal of the posterior and superior wall of the auditory canal, removal of the drum membrane, malleus and incus together with the outer wall of the attic. This turns the mastoid, mastoid antrum, attic, middle ear, and auditory canal into one cavity which is expected to become lined with skin.

When to undertake the tympano-mastoid operation for the relief of chronic suppuration is a question which must be settled upon its merits in each individual case, but as a rule such an operation should be resorted to in all cases which cannot be cured by less radical measures. As exceptions to this rule may be mentioned those suffering from well-advanced pulmonary or other organic disease, and the very aged who have had suppurative otitis media for a long time without apparent inconvenience.

In addition to the continued discharge after other plans of treatment have been thoroughly tried, persistent odor is a special symptom pointing toward the necessity of radical operation. Odor means decomposition, and decomposition means accumulation, and accumulation means failure in the efforts to drain or disinfect the deeper parts of the middle ear. So when a short course of treatment fails to relieve the odor it should be considered an unfavorable indication.

Pain in the ear, in the mastoid or in the side of the head may be slight or severe, may be continuous or intermittent. When present it points toward the necessity of an operation but the absence of pain is by no means an indication that a radical operation may not be required. The same may be said of temperature although it is the rule for patient with chronic suppuration especially with odor to have slight elevation of temperature at some time during every twenty-four hours. Tenderness upon pressure over the mastoid as a symptom is unreliable since it is found when the mastoid is not diseased and may be absent when the entire mastoid is necrotic leaving

only the outer table intact. However, as a general indication tenderness on pressure when taken with other symptoms points toward surgery.

When auscultation of the mastoid by means of the stethoscope and tuning fork shows any change in the normal density of the bone it is additional evidence of the necessity of operation.

The discovery of necrotic bone in the mastoid or deeper parts of the middle ear is a positive indication for the operation. When the perforation is of sufficient size necrotic bone may be searched for with a probe or the washings from the ear may be filtered and the debris examined with the microscope for bone cells. When the discharge is slight and evidence of necrosis is found in the ossicles the ossicles may be removed. The prognosis in such cases is fair, but unless great care is used in the selection of cases for ossiculectomy the results will be disappointing, as many of the cases will either not be cured or will later submit to a more radical operation.

A sinus is frequently found in the posterior wall of the auditory canal leading back into the mastoid. The mouth of the sinus is usually marked by a small mass of granulations though sometimes the granulations will take a polypoid form and entirely fill the auditory canal. After the granulations have been cleared away a bent probe can be passed into the sinus when its real character will be revealed. Such cases may pass for ordinary suppurative otitis media even when the drum membrane is intact and the middle ear is practically normal. When such a condition is present it is useless to waste time with non-surgical measures.

When masses of exfoliated epithelium or cholesteatomatous masses come from beyond the cavity of the middle ear proper it is useless to delay operation in the hope of a cure by the ordinary plans of treatment.

The direct objects of the operation are: 1. The removal of all diseased tissue. 2. To provide for free and permanent drainage. 3. To improve the hearing when it is possible. 4. To relieve the patient of the menace to his health and life which the presence of pus in his ear continually subjects him.

There are certain dangers connected with the operation which should not be under-estimated. Probably the greatest danger with the majority of operators is the negative danger that the operation will not be thoroughly done and hence fail to bring about a cure. The direct dangers are: 1. To the facial nerve. 2. To the horizontal semi-circular canal. 3. To the lateral sinus. 4. To the middle fossa. 5. To the internal ear by accidental removal of the stapes.

Probably the greatest of direct dangers is facial paralysis from injury to the seventh nerve. Much has been written regarding the location and course of this nerve and many rules have been given for preventing injury to it. In the writer's judgment there is but one rule worthy of consideration for preventing injury to the nerve as well as to other important structures and that is to know where they are and keep away from them. The only practical way of becoming familiar with the location of these structures is by a study of the surgical anatomy of the temporal bone on the cadaver. Cadaver experience is more necessary for the skillful performance of this operation than for any other operation on the human body. In other operations the important structures can be seen or felt and then left alone, while in the tympano-mastoid operation to see is to destroy; hence the necessity in this operation of having the location of the structures clearly in mind and of being able to go close to them without causing injury. In no other part of the human anatomy are so many structures essential to the life, health and comfort of the individual found in so small a space. After having done secondary operations on a considerable number of cases where the first operation had failed to cure and after seeing many cases in which accidents had occurred, the writer is firmly convinced that no surgeon has any right to undertake a mastoid operation, except in an emergency, until he has prepared himself for such work by repeated operation on the cadaver. In cadaver work special attention should be given to the location of the nerve and horizontal semi-circular canal for it is usually fear of injuring these structures that accounts for the lack of thoroughness in operating which is necessary to bring about a cure.

When the nerve has been injured facial paralysis promptly proclaims the fact, but when the horizontal semi-circular is injured the symptoms produced are much the same as when the stapes is accidentally removed, viz., greatly impaired hearing and more or less persistent dizziness. The semi-circular canal lies immediately below a smooth rounded bony eminence in the floor of the mastoid antrum. In necrosis of the antrum this area is rarely affected, but in removing necrotic bone the eminence has been frequently removed either exposing or taking out a section of the canal. The discomfort to the patient from this accident is sometimes comparatively slight but in many cases the disturbance of equilibrium persists for months or years. Cases are reported in which by secondary operation the injured canal has been covered with a skin graft with complete relief from the dizziness and return of the hearing to normal. In the cases of spontaneous relief from the deafness and dizziness it is

probable that in the healing process the canal has been covered over and is protected by newly formed tissue. One suggestion regarding the location of the facial nerve if kept in mind will greatly lessen the danger of injury. The nerve lies in a canal, (sometimes in a groove,) in the inner wall of the middle ear just above the oval window and at the posterior border of the middle ear it turns directly downward (not outward) and emerges from the skull at the stylo-mastoid foramen. The nerve never lies external to the attachment of the posterior margin of the drum membrane. Facial paralysis sometimes follows the mastoid operation when the nerve has not been exposed. In other cases the nerve has been exposed either accidentally or intentionally without paralysis resulting. In two cases of facial paralysis from acute mastoiditis previous to operation prompt recovery from the paralysis followed operation with exposure of the nerve. It seems not improbable that concussion due to the vigorous use of the mallet may account for paralysis in some cases especially those in which the paralysis disappears in a few weeks. If a thin sharp chisel or gouge is used the hammering will be much lighter and the danger from this source will be materially lessened.

The question of what disposition to make of the skin of the posterior wall of the auditory canal is still the subject of much discussion. The method employed by the writer in the past few years is to make a tongue shaped flap of the posterior superior skin wall of the canal. This is done by making two parallel incisions through the entire length of the canal, one corresponding to the upper margin and the other to the lower margin of the bone removed from the wall of the canal. This tongue-shaped flap is turned backward and is caught and held in place by one of the sutures closing the post auricular incision. If the two incisions making the tongue-shaped flap are carried well out into the auricle and the soft tissue and cartilage when necessary removed from the back of the flap it gives the surgeon complete control over the size of the external auditory meatus.

A large meatus with free access to the mastoid cavity by complete removal of the posterior wall of the auditory canal makes immediate closure of the post-auricular incision a safe surgical procedure. When this plan is adopted the after dressing is conducted entirely through the meatus. The head bandage can usually be left off after ten or twelve days and frequently the patient returns to his work in two weeks. It is necessary to continue the after treatment until the cavity becomes dry and is completely lined with epidermis. It is true that some surgeons who once used the immediate closure plan have abandoned it and now leave the wound open behind the ear. Inquiry has convinced the writer that their method of dispos-

ing of the posterior wall of the auditory canal did not give these surgeons free permanent drainage and perfect access to all parts of the operation cavity. During the healing process the cavity must be frequently inspected and exuberant granulations kept down either by cauterization or removal. Their removal can be accomplished by means of the sharp curette or the angular ear polypus forcep. When these granulations are permitted to form they keep the cavity from becoming lined with epidermis and thus indefinitely prolong the healing process. When they form and are allowed to remain on the inner wall of the middle ear proper they impair the hearing by preventing sound waves reaching the internal ear.

The prognosis as to hearing after the tympano-mastoid operation is often a serious question. When the function of the internal ear is normal and the granulations can be kept away from the wall between the middle and the internal ear the patient ought to be able to hear an ordinary whisper three or four feet away. When before the operation the whisper can be heard more than three feet no improvement should be promised, but when the whisper can be heard less than three feet, if bone conduction is good, it is safe to state that the hearing should be improved.

In cases of operation for acute exacerbation of a chronic otitis or for any condition of the mastoid or brain which has been preceded or brought about by a chronic otitis, the question of tympano-mastoid operation should be carefully considered. The ordinary mastoid operation may relieve the immediate trouble but frequently it does not stop the chronic discharge nor prevent a recurrence of the acute condition. Permanent relief in many of these cases can only be secured by thoroughly cleaning out both the mastoid and the middle ear.

In the time allotted a detailed consideration of the various aspects of the tympano-mastoid operation for the cure of intractable suppuration is impossible. The tendency of otologists in these cases is toward more radical measures and the profession generally is becoming cognizant of the fact that the cases which do not respond to cleansing medication and capillary drainage can be cured by the tympano-mastoid operation.

DISCUSSION.

Dr. W. E. BRIGGS (Sacramento, Cal.). I am much pleased at this paper. It has been for me a difficult matter which presents itself every day in my practice to know what to do with the chronic suppurative cases. At some stages of my practice I have advised radical operation more than now. Some years ago in Paris in Luc' clinic,

he told me he advised radical operation if he could not cure the case in a month. If he found granulation or polypi in the ear, that was another indication for a radical operation. In his practice this may be a good rule, but in the hands of many less skilled operators with less experience, it would be safer for the patient to defer the operation until he had tried other and more conservative treatment of the ear conditions. The radical operation does not always cure the case. The treatment is usually tedious and long and more or less expensive. In my own practice I know I have found many cases of granulation and polypoid growths become perfectly well in a few months, and I would not lay down a hard and fast rule as some do. I think the essayist's advice is good on that account. It is a matter of judgment, and probably as much a matter of personal experience and skill in the operation as anything else and as in any other operation. The operation Dr. Andrews advocates is certainly a good one. I think occasionally he might place Thiersch skin grafts on the bone that is not covered by the posterior flap of the meatus and get much more prompt healing of his cases. I have had cases which were perfectly covered with skin in ten days; one case within two weeks went home perfectly well and has been well for two years. The secretion from a granulating surface prevents the cavity healing as promptly as it would if the whole wound were covered with skin.

Dr. BRYANT. It seems only fair that when the symptoms are not urgent, the patient should have the benefit of the doubt and receive local treatment with the expectation of recovery. Even where there is discharge and granulations and caries (not extensive) there is a very good chance. There are occasional irregularities met with in the temporal bone, even the facial nerve sometimes takes an unusual course, (See the case reported by Berens) passing downwards and outwards from the oval window to emerge from the bone near the level of the external end of the osseous meatus. To avoid the deleterious results of hammering on the cranium, the front bent gouge can be used very effectively. It also lessens the danger of accidentally penetrating the dura, and if desirable it can be used with a mallet.

Dr. ANDREWS (closing discussion). There is no time limit, in my judgment, for continuing the treatment in suppuration of the middle ear before advising the radical operation. I have seen cases recover that were treated for several months before recovery took place. But where conditions are found which make it improbable or impossible for a recovery to take place, then why should the patient go on with his life and health continually subjected to the

danger which accompanies the presence of pus in the middle ear, when an operation, if properly done and taken care of afterwards, will cure the case? It is true that the radical operation does not always cure, but I firmly believe if it is properly done and then properly treated afterwards, it will cure; and I also think the after treatment is just as important as the operation itself. I did not say that the nerve never took an outward course after tending downward. I did say it is not often external to the posterior attachment of the drum membrane. I know we are prone to believe when we have a paralysis following mastoid operation that it is because the facial nerve pursues an anomalous course; but in the majority of cases the anomaly is in the mind of the operator, and not in the patient's facial nerve.

ORDINARY TONSILLOTOMY.

BY EDWIN PYNCHON, M.D., CHICAGO.

(With presentation of New Instruments)

Protruding tonsils, which are easily removed by the ordinary operation of tonsillotomy, are not so frequently encountered of late as during former years. At least such has been my experience, and I believe others in special practice have noted the same change. I presume this is largely due to the fact that, year by year, tonsillotomy is more frequently done by the general practitioner, for the profession, as well as the laity, are fortunately becoming reconciled to the idea that the removal of the tonsils, instead of precipitating all of the evils imaginable, as formerly taught by the good old family doctor, tends, on the contrary, more than most any other operation done, to benefit the general health of the race and even to materially increase the chance of longevity.

With the increasing popularity of this operation, the easy cases, with markedly protruding tonsils, are promptly nabbed by the general practitioner, or when semi-submerged the projecting top is removed, so that after running the gauntlet of the G. P., the poor specialist generally finds in his net only the more difficult cases wherein the tonsil is more or less submerged, or those cases wherein a large, buried base remains after a clever decapitation. This seems to be the most rational explanation as to why the character of this class of cases is gradually changing, and why the pedunculated tonsil of bygone years has now become a *rara avis*.

The ill effects derived from enlarged tonsils are due primarily to their presence as foreign bodies in the throat, which is relatively small as compared with the size of the tonsils, so through the combination nasal respiration is obstructed. In all such cases even a partial removal is of benefit, and will bridge over the trouble for a time. At a later age, as the fauces enlarge, and mayhap the tonsils become somewhat reduced in size, the feature of obstruction to respiration is diminished, though other and equally unfavorable conditions obtain wherein the ears, and the pulmonary and gastro-intestinal tracts are unfavorably affected through mal-secretions from the tonsillar follicles, and associated chronic inflammation of the faucial, post-nasal and even Schneiderian m.m., through continuity

of tissue is observed. No operation of tonsillotomy will correct these manifestations, and the only relief available will be from a radical tonsillectomy.

In the section of Laryngology and Otology, at the recent meeting of the A. M. A., at Atlantic City, while the tonsil received its full quota of attention, it was an observable fact that the consideration of ordinary tonsillotomy was conspicuous only through its total neglect, and that the trend of the times was to deal with radical removal combined with a passive acknowledgment that the submerged tonsil had come to stay.

The method of operating for the removal of tonsils will necessarily vary in different cases. As before stated, the large and more or less protruding tonsil, with which this paper deals, when in the small throat, should be amputated as thoroughly as is compatible with the conditions present. Probably the most frequently used instrument is the tonsillotome of Mathieu, an evolution of the Fahnstock pattern, which, with others of its class, is designed by means of a pointed or barbed elevating mechanism to pull the tonsil through the fenestra,



Fig. 1.—Tonsillotome ($\frac{2}{5}$ size.)

while in its use but little pressure can be exerted upon the pillars. In contrast therewith, the next most popular instrument is Mackenzie's modification of the Physick tonsillotome, which, with others of its class, is so constructed that the important feature in its use consists in pressure upon the pillars, which pressure varies in degree according to the pattern employed and the skill of the operator. In this way the tonsil is made to project through the fenestra, owing to outward pressure upon the adjacent pillars. It will be thus seen that the salient property of the two classes rests respectively in the pull of the first as compared with the push of the second.

In the use of either instrument some operators favor external pressure, which is of necessity but mildly effective in elevating the tonsil, and less efficient with the first class of tonsillotome than with the second. Different operators have furthermore, particularly with the second class of instrument, employed forceps, for pulling the tonsil outward from its bed. In order to depend upon forceps for this purpose some operators have even dispensed with the elevating mechanism of the first variety of instrument. The advantage of the

forceps is that with its use, instead of simply and automatically pulling the tonsil outward, and in one direction only, as is done by the elevating mechanism alluded to, the pull can be so modified and directed that the greatest bulk of the tonsil can be brought within the grasp of the advancing knife edge, and when combined with strong outward pressure upon the pillars, as is best done with instruments of the second class, is of necessity the most efficient method of operating, though one disadvantage in the use of the two instruments conjointly has been that an assistant is generally required in order to keep the tongue down with a depressor.

As better work can be done by not crossing the hands while operating, it is apparent that the two instruments, the forceps and the cutting device, must be changed from one hand to the other, as a change is made to the opposite side after the operation on the side first selected; and right here is where the trouble occurs. Unless the

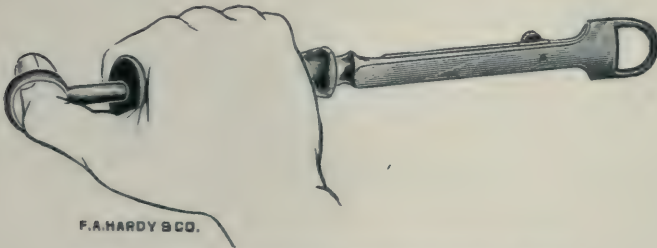


Fig. 2.—Shows how tonsillotome is held for patient's left tonsil.

operator is ambidextrous to a marked degree, and but few are so blessed, he experiences an embarrassment in operating upon the side which comes most awkward for him. As I unfortunately belong to this latter and larger class, I have for some time been experimenting with the idea of producing both a tonsillotome and tonsil forceps, either of which can be used equally well with either hand when one does not possess this rare ambidextrous skill.

I take pleasure in presenting the result of my experiments, selecting the tonsillotome first. For reasons previously given, I have chosen the second type of instrument as my model, and have applied thereto a handle in straight line with the distal end, whereby the greatest outward pressure upon the pillars can be obtained. The cutting end is given a slight curve on the flat, as I have for several years used in a Mathieu tonsillotome,* in order to better conform to the natural curve of the faucial side walls. The cutting blade is spring actuated, so it will automatically remain protected until pressure with

* *Annals Otology, Rhinology and Laryngology*, February, 1900.

the thumb is employed. Lastly, the distal end is of such medium size that while the instrument will answer for quite a small child, still it is large enough to allow a pretty large tonsil to be pulled through the fenestra, particularly when the tonsil is firmly grasped by a forceps which will not slip or yield, and with which firm traction can be exerted. A tonsil which is apparently too large for the fenestra will easily slip through it after the attachment to the pillars has been severed. The fenestra in this instrument is somewhat larger than would appear from its cross and vertical diameters, owing to the posterior edge being made without curve, which thereby better conforms to the line of attachment between the tonsil and the anterior pillar. I might add that this tonsillotome is easily taken apart for cleansing.

The tonsil forceps I present is constructed upon an entirely new plan, and is easily operated with either hand for either tonsil. It furthermore, by the removal of a single screw, can be quickly taken apart for cleansing. The motion of the grasping end, in its operation,

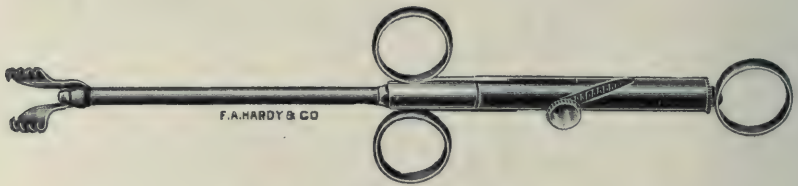


Fig. 3.—Tonsil Forceps ($\frac{2}{5}$ size).

resembles the bite of a bull dog, with spread enough to easily grasp the largest tonsil met with, and yet when closed, while being introduced into the mouth, occupies a minimum of space, and when applied, owing to its slender shaft, is neither in the way nor obstructs the view, and furthermore, like the tonsillotome, is spring actuated to release its hold. In its application, while seizing the tonsil, it is held parallel with the median line, as the teeth of the jaws are parallel with the shaft, but after the grasp, the handle is carried to the opposite side of the mouth, whereby the greatest traction is first exerted upon the anterior edge of the tonsil which is desirable, though, as the incision proceeds rearward, the posterior elevation progresses. In its operation, while making the grasp, the shaft must be slightly rotated to the left, it being held by the operator, as is a Mathieu tonsillotome, with the thumb in the end ring.

The first essential in the operation of tonsillotomy is that the mouth of the patient shall be securely held open with a gag which will not slip, as will most of the gags in use, which generally engage the

molars. Having for some years employed a Ferguson mouth-gag, and having been charmed with its compactness, power and mechanism, I have taken the liberty of so changing it that instead of being held between the molars as formerly, it is made to engage the central incisors, and in place of a lead packing, is furnished with a rubber pad for the teeth, both above and below. With this change its maximum spread is about two and one-half inches, which is much more than is usually required, and it remains exactly where placed, and gives the best possible command of the field of operation.

By engaging the incisors, the point where the teeth are furthest apart, it leaves free at either side the lesser space between the molars, and does not interfere with the heel of the blade of the Mackenzie tonsillotome, nor with the most free lateral motion of any instrument being used. In fact, I cannot see why it should not, with this change, be better adapted than before even for staphylorrhaphy, for which, I believe, it was originally designed.

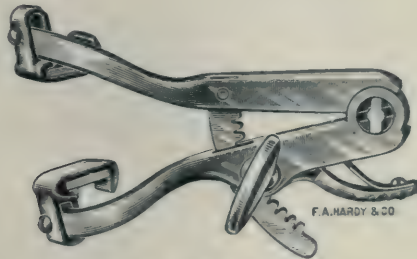


Fig. 4. — Mouth-Gag ($\frac{1}{2}$ size.)

After the adjustment of the gag, the patient is securely held by a trained assistant in the usual manner, while a second assistant steadies the mouth-gag, and forcibly holds the child's head upon one shoulder of the first. The forceps is next passed through the fenestra of the tonsillotome which is thus suspended, with the convexity of the cutting end toward the patient's mouth, as the forceps, while held in the operator's left hand for the patient's left tonsil, and *vice versa*, is made to grasp the tonsil, the tongue meantime being depressed by the free hand of the operator, after which the depressor is removed, and the handle of the tonsillotome properly grasped, when, with the fenestra encircling the shaft of the forceps, the instrument is guided back to the tonsil and properly adjusted with the required pressure, the tonsil meantime being pulled forward through the fenestra, and so rolled or twisted as to bring it entirely outside of the path of the knife, which is then advanced by pressure with the thumb, when the tonsil, with both instruments, is removed. If a

double tonsillotomy is to be done, the forceps is changed to the opposite hand and the steps previously described repeated. Generally speaking, it is better to first remove the tonsil which seems to be the most difficult of removal, provided it is intended to operate both at the same sitting. The tongue depressor shown is the one I have found the most convenient to use in this operation, it being one designed by Dr. A. H. Andrews of Chicago, to which I have added lateral wings bent slightly downward as well as the tip, whereby the tongue is better secured and prevented from slipping to either side.

In case there is an adhesion of the pillars to the tonsil, which must be first severed, an assistant is required to manage the tongue depressor while the separation is being made after the application of the forceps which, in case of the patient's left tonsil, can be done as a step of the operation as described, while, with a right-handed operator, when operating the patient's right tonsil, the separation must first be done as an independent step, after which, by changing the forceps to his right hand, he proceeds as before outlined.



Fig. 5.—Tongue Depressor ($\frac{1}{2}$ size.)

The question of anæsthesia will be decided in each case by the operator. Personally, I am becoming more and more fond of operating without an anæsthetic, owing to the loss thereby of the chief danger of the operation, and feeling that the suffocation incidental to the semi-asphyxiation of the anæsthetic is often of as much annoyance to the little patient as is the operation itself. In those cases wherein a brief anæsthesia will do, and its use is demanded, my preference for nitrous oxide gas is on the increase. In this case, the operation is done in the dentist's chair, at his office, which does away with the requirement for assistants, and incidentally avoids all that preparation before, and cleaning up after, which is necessary when the operation is done in the physician's office. Nitrous oxide anæsthesia, while perfectly safe, is too brief to nicely permit of an ade-

noid operation at the same time the tonsillotomy is being done. With nitrous oxide the gag shown cannot be used, as the anæsthesia mask must tightly cover both mouth and nose; therefore, the dentist employs at first a mouth prop attached to a string, and later another form of gag, quickly applied, with the use of which he is familiar.

The best illumination is given by an electric head lamp, which is far better than a reflector on the forehead, owing to the uncontrollable motions of the patient which, while not marked, are easily sufficient to cause the field of operation to evade the focus of light. Furthermore, the source of illumination, viz.: the lamp, is either too distant or in the way. As a second choice, a large north or east window at the back of the operator, is to be preferred, with the patient facing the light. In fact, the two methods of illumination advised can wisely be used in combination.

DISCUSSION.

Dr. GOLDSTEIN. I wish to be among the first to name Dr. Pyncheon the prince of mechanical geniuses in the Academy of Ophthalmology and Oto-Laryngology.

However, may I be permitted to say that I cannot see the occasion for so much fuss in the operative conduct of ordinary tonsillotomy. Heretofore the Mathieu or some other modification of tonsillotome has answered very well and there seems to be an immense amount of mechanical manipulation and unnecessary dissection to excise that poor little faucial tonsil. It is my opinion that as long as we can obtain satisfactory results with the usual technique to which we have been accustomed for several decades, and when the tonsil is not imbedded and there is no occasion for much preliminary dissection of faucial pillars and adhesions, the simpler the form of operation and the less the number of instruments, the better.

Dr. KYLE. I think the more fuss we make about instruments the better. I remember trying to use the Mathieu tonsillotome with harpoon. It became fixed in the foramen and after driving the harpoon through it became fixed in the tonsil. I hustled as well as I could and succeeded in getting out my tonsillotome. I have used the McKenzie, and found that the blade slipped down in trying to hold the tongue down, and I would only get a portion of the tonsil. A suggestion that will keep the blade in position until you slip the tonsillotome over the tonsil is a good one.

Dr. BALLENGER. I wish to speak of two accidents that occurred in the use of the Mathieu instrument in ordinary tonsillotomy, both recently, I think in the last week or two. I had the cutting blade of

the tonsillotome break off, which fortunately was immediately spit out by the patient. Shortly before that, Dr. Beck had a similar accident with one of my instruments. This had been in use for some eighteen years, and had a right to break, I suppose. The lesson is that these accidents are liable to occur. Dr. Beck had an experience also in which the portion of the blade broken off was swallowed by the patient, and the X-Ray show the presence of the portion of the instrument in the patient's stomach.

Dr. REYNOLDS. Before the discussion closes I want to say a word. I have a long, narrow shanked, narrow bladed pair of scissors, curved at right angles to the direction of the shank, and I can take off the portion I wish with a single snip. I want to know what is the matter with that as an equipment for taking out the tonsil. I object to the removal of the entire gland. Good surgery demands that the altered or hopelessly diseased part alone should be removed by excision.

Dr. CLINE. I do not see the use of having so many instruments to do an ordinary, simple tonsillotomy. Of course Dr. Pynchon is an expert in getting up these things and he likes to use them, but I cannot see the advantage in using four or five instruments, when two are all that are needed. I seldom use anything but the tonsillotome and the tongue depressor. I gauge my instrument to the size of the tonsil, and I find myself using the same instrument now for almost all sizes of tonsil. I set it so that I can just force the tonsil into the ring. By getting well down into the throat, and then turning the instrument up you will be surprised how easily the tonsil, if not too much adherent, will be forced into the instrument. You can take out all the gland necessary by this method. I do not believe in taking every vestige of the tonsil out. We want to get rid of the obstruction and the portion that is diseased, and that is all that is necessary in the operation. There is a decided difference of opinion about this. I do not use an anæsthetic, as a rule, only as an exception. I think the depression and the ill effect on the patient from the anæsthetic, to say nothing of the danger you run of sacrificing life, is something that is unnecessary. With the use of cocaine or eucaïne, properly applied, I think it can be done with little pain. It is so quickly done. It is necessary to take a little time to engage the tonsil properly, then it is over in an instant.

Dr. D. T. VAIL. I want to offer an explanation of the accident which occurred three times in Chicago in connection with the old fashioned Mathieu tonsillotome. I saw this accident happen, and

once it nearly happened to me. Having thought the matter over, I concluded the fault was not in the instrument, but was with the operator, or rather with the vulcellum forceps used.

Just as the tonsillotomy is about to be performed the patient sometimes gags and the left hand holding the grasping forceps has allowed the tonsil to slip back slightly and the sliding blade of the Mathieu tonsillotome gets caught on the teeth of the vulcellum forceps as it is being driven home.

Dr. Goux. When I was in college, a professor of Internal Medicine said never to treat the symptoms but the cause of the disease. I believe we are getting away from the cause of the trouble. I do not believe it is so much the fault of the tonsillotome, but rather of the technique in not sufficiently releasing the tonsil from the pillars so it can be slipped into the instrument. Break up the adhesions properly and the tonsillotome in most cases will slip easily over the tonsil.

Dr. PYNCHON (closing discussion). In reply to Dr. Goldstein's criticism I will say that while the technical description takes considerable time, the operation does not take any more time than with the ordinary instruments we have been using. As regards the breaking of the Mathieu instrument I had one break once while loaned to a medical friend. It did not break on account of the blade being put in wrong, as that was impossible, it being one of my design, curved on the flat. There is no doubt but that the barbs are a bad thing. I used to always have them cut off. It seems to be a great fault that it is possible to put these instruments together wrong. I believe the only extra instrument I use is the mouth gag. As to the removal of the tonsil I believe the more we can remove the better. Bosworth was a strong advocate for the removal of the entire tonsil. In childhood the tonsil is not diseased but is hypertrophied tissue. My own experience in the application of cocaine before ordinary tonsillotomy is that it is nil. The child objects to the operation as much with as without it. In fact its bitterness adds to the annoyance.

GRAVE HEMORRHAGE FOLLOWING TONSILLOTOMY.*

BY L. C. CLINE, M.D., INDIANAPOLIS, IND.

On Sept. 24, 1903, Mr. K. called at my office with his son, aged five years. The father stated that the son had been afflicted repeatedly with sore throat or tonsilitis for three years, and that he was very anxious to have him relieved if possible. Examination revealed hypertrophy of the tonsils, the left being larger than the right and presenting a nodular and ragged appearance. The right tonsil was well defined but small. The boy was robust and healthy in appearance.

Following my usual custom of investigating every operative case as to a hemorrhage diathesis and explaining to the father that about the only thing we feared was bleeding after the operation, but this danger as a rule was very slight in children where there was no bleeding history. I told the father the tonsils should be destroyed or removed, and inquired if he knew anything in the family history or have any cause to fear hemorrhage after clipping out the tonsils? He answered that he did not know of anything to contra-indicate such a procedure.

I at once proceeded to remove both tonsils with a McKinzie tonsillotome which was quickly and easily accomplished. There was about the usual amount of hemorrhage that occurs in such cases, which entirely ceased in a few minutes. After one-half hour wait, and again looking at the throat and finding it free from oozing, they returned home. The hour was 10:30 a. m.

Nothing more was thought or heard of the case until 5 p. m., when I received a telephone message to come to the house at once, the boy was vomiting blood. On arriving I found the left tonsil slightly oozing. An ordinary sized chamber was sitting beside the couch which looked to be about one-third filled with dark clotted blood.

A solution of suprarenal capsule was immediately applied to and around the bleeding surface; this seemed to stop the bleeding. Before leaving, I prepared a gargle of gallic and tannic acid to be used frequently. At 10 o'clock I was called and found he had again vomited quite freely of blood, the cut surface was oozing. I then applied the adrenalin 1 to 1000 and gave him 5 drops internally, which to all appearance controlled the hemorrhage. Before leaving,

I carefully applied a 40-grain solution of silver nitrate for its astringent effect. Ice bag was applied to the neck and cracked ice given by the mouth. Adrenalin was ordered in three to five drop doses every four hours.

On calling in the morning I found that he had again thrown up quite a quantity of blood. The child was growing very weak and faint. Finding the surface oozing again, I applied a solution of chromic acid and ordered fluid extract of ergot internally. Quiet and the ice were continued with an occasional enema of normal salt solution. Vomiting occurred at 10 a. m. and at 5 p. m., when I again applied suprarenal capsule with pressure which was followed with Monsel's solution. The patient had now grown very weak and irritable from the loss of blood. I ordered 3 or 4 drops of laudanum followed by 5 grains of chloride of calcium in four ounces of warm water to be injected high up in the colon every four hours. This was alternated with a pint of normal salt solution. A small amount of blood was thrown up again at 11 p. m.

There was no further bleeding for 24 hours. The boy although very weak had taken some nourishment and had begun to improve. On the morning of the fourth day after a fit of coughing the bleeding was started again. Examination now revealed both tonsils bleeding, pulse was very weak, beads of perspiration was observed over the face and neck. The cadaveric appearance of my patient was not very encouraging. I at once gave an injection of normal salt solution to be alternated with 5-grain doses of chloride of calcium by injection. Local applications were made as before. Vomiting occurred twice during the day and once during the following night when the boy had a prolonged sinking spell from which he revived after a dose of strychnine and the salt injection.

For the succeeding 24 hours life seemed to hang in a balance responding only to strychnia and the normal salt solution injections. After about all the remedies that I could command had been tried and all the red blood had oozed away and had been replaced with the salt and calcium solutions, my patient was with careful feeding and the use of tonics gradually restored to health.

On my first visit to the house I learned from the mother of the boy that his grandfather was a bleeder all his life and that his life was spared on various occasions. She stated that had she known the boy was to be treated she would have told me about the grandfather and also that when the boy received a scratch, cut or bruise, there was a great tendency to bleed and effusion, and would get well very slowly. All this the father frankly admitted he did not know. The

father thought he would do his wife a kindness to have the tonsils removed without her knowledge as she was far advanced in pregnancy.

The only pleasant remembrance I have of this case is the very cordial treatment with never a word of criticism during the entire treatment and a prompt and full settlement of the account.

I hope you will pardon the details of this case but it shows how we may be misled after all the ordinary precautions.

DISCUSSION.

Dr. THOS. FAITH (Chicago). I personally have had considerable experience with the use of calcium chloride in bleeders. From the standpoint of the physiology of the coagulation of blood, calcium salts are important fibrin forming factors. It may be given, however, in larger doses than Dr. Cline gave without, in the least, causing any unpleasant symptoms. I have given it in children in 15 grain doses, taking particular pains to get the C. P. crystals. I want to say in addition that internally gelatin is of advantage in preventing hemorrhage. The patient is given large quantities of gelatin to eat in all forms in which he can take it, or it may be injected into the bowel. If he be a bleeder, this administration may be kept up for weeks before the operation is undertaken. Gelatin being an albuminoid, it facilitates coagulation. While it can not be utilized as a proteid, yet it favors the coagulation of the blood by saving other proteids which are important fibrin forming factors.

Dr. REYNOLDS. I call attention to the well-established hemostatic action of gallic acid, internally administered. It is always well borne by the stomach, even in children. Five grains of gallic acid every three hours, in my opinion, would have stopped the hemorrhage.

Dr. PYNCHON. This is a matter that strikes all of us. My custom in practically all cases is to give them such advice in advance as will prepare them for emergencies in case there is a hemorrhage after leaving the office. The best thing, of course, is to prevent it, and for that reason I prefer to operate on only one tonsil at a time. Certain things have caused hemorrhages in the past, and the best thing is to warn patients against doing these things. I have gotten out a printed sheet of directions to give the patients as regards diet, etc., and one section I devote to hemorrhage. The one thing as satisfactory as anything I use is the gargling with very cold water. This means a glass of pounded ice with a little water in it. Gargling with this will have a very pronounced effect. If a little alum is put in the

water it is about as good as anything. I also give the formula for the tanno-gallic acid mixture, and I tell them if the gargle of ice water does not stop the hemorrhage to then take this mixture as directed. There are also directions which I have added with the object of being of assistance to the physician who may be called in, and one of the most valuable things I have found is the Ergone of Parke, Davis & Co., a new preparation used hypodermically. Morphine also is of benefit.

Dr. CLINE (closing discussion). As I stated in the paper, the ordinary precautions were taken in this case, and one of the points made is that we may be misled, intentionally or otherwise, in these cases. I was particularly careful to investigate about the diathesis. I always keep a compressor or hemostat to use in cases of adults; but this was a child, and after the bleeding had begun the second time, the child became so irritable that I could not use it to advantage without great disturbance, possibly creating greater hemorrhage.

PHARYNGOCELE, OR DIVERTICULUM OF THE PHARYNX.

BY WM. D. BLACK, M.D., ST. LOUIS, MO.

ETIOLOGY.

Regarding the true origin of these pouches there seems to be different opinions. Among the probable causes we have:

First. Congenital, those due to the nonclosure of the branchial clefts forming inner incomplete fistula. References Kostanechie. L. Brown, Wyle, Von Bergman and others.

Second. Weakness of some part of pharyngeal wall. McKenzie, Newcomb, Kyle, Wright, L. Brown and McBride.

Third. Those arising from stricture of œsophagus and developmental defects in which the lower part of pharynx may take on sacculation.

Under the head of Congenital Defects we must have contributing causes in order to form pouches. These small incomplete fistulæ may become large sacs by any sudden or gradual pressure. Under that of sudden pressure may be mentioned Traumatism, heavy lifting, and excessive vocal effort. Under the caption of gradual pressure we have, sudden bolting of imperfectly masticated food, over-filling the channel with fluids, and foreign bodies lodging in these pouches.

Under the caption of weakness of some part of wall without inner incomplete fistulæ we have, improper mastication and swallowing of food, over-filling the channel with fluids, and loss of muscular tone due to disease.

It seems quite plausible that these sacs can arise from repeated continued efforts on part of patient to rid the channel of its contents, and this force, or outward pressure, not being equally distributed causes the weakened part of the wall to yield.

PATHOLOGY.

Rokitansky made a post mortem in a case which had existed for 46 years. The mucous membrane at the back part of the mouth was thickened and the upper part of pharynx was œdematous. On the level of the inferior constrictor the membrane was prolonged through the fibres of the muscle, into a diverticulum about two inches long. The walls of the pouch contained a few bands of pale muscular fibres.

Bertig found in the cadaver of a man 55 years old, in the upper part

of pharynx, bilateral, symmetrical, moderately fluctuating sacs. These overlapped the superior concave margin of the superior constrictor and were mostly lateral like a hernia. These are the only cases that I could find in the literature at my disposal where a post mortem had been made.

SYMPTOMATOLOGY.

The symptoms of diverticulum must vary according to the position and size of the pouch. Small diverticula may exist and cause practically no symptoms. When they occur laterally and high up there exists a feeling of fullness in pharynx. Dysphagia without actual pain. When filling of pouch occurs you will find a tumor in the side of neck.

Ejection of food is a symptom of importance, especially when you have the tumor externally and which recedes after ejection of food. Spasm of larynx due to small particles of food falling into it when the sac is being emptied. Protusion of the pouch. Increased secretion of saliva. A few cases, including my own, complained of this, and am inclined to believe it is simply reflex from the obstruction.

Emaciation. This is variable as many cases appear well nourished. Emaciation can occur where the diverticulum is low or due to stricture of œsophagus. When the pouch is low in the posterior wall of pharynx the sac frequently passes downward between the œsophagus and vertebral column and, unless elongated, or where it is not easily emptied, there is little danger of emaciation.

AGE AT WHICH THEY OCCUR.

These pouches may occur at any age, although I believe they are more frequent in the young owing to congenital defects in development. Those cases occurring in middle life are all probably due to weakness in the pharyngeal wall.

DURATION.

The length of time these diverticula may exist without danger to life is very indefinite. Cases have been known to have existed for 40 to 50 years. Mackenzie and Rokitsky.

DIAGNOSIS.

The diagnosis is usually easy as the patients do not complain until the pouches are quite large and then by laryngoscopic and digital examination you can see and feel the offending mass.

PROGNOSIS.

The general opinion among laryngologists is that they are not dangerous to life, but I do not take so sanguine a view. When the

sac is elongated and low down in the pharynx there is danger of emaciation from pressure on the œsophagus, and, when they are high up in the lateral wall of pharynx, they can pass downward and cause suffocation:

TREATMENT.

Electricity; massage; bandage of neck; thorough mastication of food; drinking and eating slowly of semi-solid or liquid food. Operation when dangerous to life or great inconvenience to patient. Billroth. Von Bergman and others have dissected them out successfully.

REPORT OF CASE.

Patient referred by Drs. Higginbottom and Greer of Vandalia, Ill. Name, Samuel X.; age, 54; color, white; weight, 170 pounds; occupation, farmer; previous history good. No specific or organic disease. Patient apparently healthy.

About two years ago patient experienced a soft mass protruding into the back part of mouth and recurring at irregular intervals. There was no pain on swallowing. After a time patient claimed that he could catch the soft mass between his teeth, and that it was not painful on pressure. I was informed that about two weeks before seeing the case a physician near Vandalia caught the mass with a forceps and removed a part of it, causing severe hemorrhage. After consultation, the physicians in attendance decided to place patient under my care.

EXAMINATION OF PATIENT.

Nose. Right nostril; large middle turbinal. Left nostril; small ridge in the septum with some enlargement of turbinals. Post nasal space. No abnormality other than a slight enlargement of turbinals. Pharynx: Arches, pillars, post pharyngeal wall and base of tongue normal.

Examination of Larynx. Owing to the extreme sensitiveness had to cocaine thoroughly. I suspected a pedunculated cyst of the larynx and was much surprised upon finding it normal with the exception of a small clot of blood on the right cord. Now, being positive that the disturbance was not in the larynx, I proceeded to examine the lateral and posterior walls of pharynx, and found that on the posterior lateral wall of right side there was a small mass, somewhat rounded in form, about $\frac{1}{3}$ to $\frac{1}{2}$ inch in diameter, situated about on a level with the upper margin of epiglottis. Next made digital examination, causing patient to gag, and then the mass appeared apparently resting on the dorsum of tongue. From its color

and general appearance it resembled the normal mucous membrane, only it appeared irregular and not rounded as it did in the position of rest. It remained stationary only for a few seconds, disappearing rapidly by the patient's forced efforts to swallow. I repeated the digital examination several times, and each time the mass appeared as before almost filling the fauces.

The diagnosis of pharyngocele was then made and decided that the case would make an interesting clinic and had the patient accompany me to the College (Medical Department of St. Louis University), and had Dr. H. W. Loeb examine the patient. His examination revealed the following: A small fairly rounded mass about $\frac{1}{2}$ inch in diameter appeared on the posterior lateral wall of pharynx, the superior margin of the mass being just about the level of the epiglottis when in its erect position. When the patient's throat was manipulated, so that he gagged, the character of the condition became manifest as there was an evagination of the sac to such an extent that the anterior end of the mass reached the hind molars. Its size was approximately about $2\frac{1}{2}$ inches by $\frac{2}{3}$ of an inch in diameter. Before the mass appeared the patient seemed to be trying to regurgitate food. Dr. Loeb now agreed to the diagnosis and thought it was of congenital origin, but owing to the duration and seemingly sudden onset I thought it was acquired. In my opinion the constrictors played a prominent part in the expulsion of the mass, probably through irritation causing the muscles to contract and forcing the pouch upward. We could not find the place where it had been incised and my explanation is that it had probably healed. He complained of some soreness on that side. The tumor or mass appeared about two weeks after he first complained and after a few months it appeared quite often: some days it protruded twenty times. By assuming the stooping attitude, such as in hoeing corn, etc., it would appear, showing that it certainly was lax and followed the law of gravity.

Patient had to return home and nothing more was heard of him until December 8, 1903. His physical condition was about the same, only his throat was causing him more trouble than before, the tumor appearing about six times daily and, using his expression, packed or clogged his throat, and he feared suffocation. I decided to treat him with the galvanic and faradic current and inserted the positive pole on the posterior lateral wall of the pharynx as low down as I could, and the negative on outside of neck. Used it for ten minutes daily for one week and after the first day the mass stayed in position and never appeared again while patient was under treatment.

About the second day after using the current had Dr. M. A. Goldstein see the case, and upon laryngoscopic examination found the mass in the hypopharyngeal space on right side. It still had the somewhat rounded appearance and the diagnosis was again confirmed. Could not get him to protrude the mass by digital examination and concluded the electrical current increased tonicity of the membrane. Had patient get a small battery to use at home and put him on strychnine—1-30th grain three times daily. Received the following letter from his friend, he being illiterate, dated December 31, 1903: He had not seen Mr. X., for two weeks, but the last time he saw him he felt somewhat better but still had choking spells.

January 9, 1904, received another letter from his guardian in which he stated that Sunday night and Monday the patient had a severe spell. Suppose he meant choking attack.

It was arranged that the patient would again be under my care as soon as he felt better, but on Wednesday, 3 a. m., he died. His sister informed his friend that she found him on the floor gasping for breath and after a few seconds he was dead. From the entire description there is little doubt in my mind but that the mass passed downward into the larynx and caused suffocation.

Had the authorities on the subject not given such a good prognosis in regard to life, am positive I would have dissected it out.

DISCUSSION.

Dr. Jos. BECK (Chicago). In the last December meeting of the Chicago Society I presented a case of a low pharyngocele between the oesophagus and pharynx in a man 70 years of age. He came to me for relief of a cough. The cough would not be relieved until he vomited. It would come on after eating. He had never had trouble until he was old. I treated him for pharyngeal trouble and sent him to a general man, who treated him for gastro-intestinal catarrh, washing out the stomach. He suggested to me that it might be a case of diverticulum, so we took the patient to the X-Ray laboratory and took a picture. I am sorry I did not bring that, for it showed beautifully that it was a diverticulum. I remember that Gussenbauer reported several cases excised by the external route. If this patient had not been so old I believe I should have suggested operation. In Dr. Black's case, I see no reason why the gentlemen, when they made the diagnosis, did not suggest an operation.

Dr. LOEB. I had the pleasure of seeing this case and was much interested in it, and on account of the rather harsh treatment he re-

ceived at my hands he could not be prevailed upon to see me again. But I saw nothing in the case that did not justify a diagnosis of diverticulum. The mass is well described by Dr. Black, particularly the startling effect of this mass springing out and resting on the molars. The operation would have been easy to perform. He gave a history of two years, but he may well have had it longer than that. It was a very interesting case.

Dr. GOLDSTEIN. Diverticulum of the pharynx is an unusual thing, and I was glad to see this case. The reason I offered a favorable prognosis was that the patient had been getting along well for a year or more, and this condition of the bulging of the pharyngeal diverticulum had been less frequent in the past few months, and the galvanic treatment had been instituted. As the protrusions were becoming less marked, I felt a favorable prognosis was proper in the case.

Dr. BLACK (closing discussing). My reasons for not operating were: 1. That the patient would not consent, but said he would later if he didn't improve and if I could not get him well. 2. Most of the leading authors gave such a good prognosis that I was not in any hurry to operate. 3. There was no emaciation and the patient was apparently healthy.

In the case mentioned by Dr. Beck, he found a tumor filled with food; while in my case there was no tumor apparent externally, which in my opinion was due to the sack being closed at its upper end when in the position of rest. The sack became longer as it grew older and was probably lengthened by being frequently forced upward by the constrictors contracting.

DISEASES OF THE MAXILLARY ANTRUM, THEIR DIAGNOSIS AND TREATMENT.*

BY EMIL MAYER, M.D., NEW YORK CITY.

The largest, most dependent from above downwards, most frequently affected, and, all things considered, most readily treated of all the accessory sinuses, is the maxillary sinus the antrum of Highmore.

There is abundant literature relating to this and other sinuses, and the presentation of this brief paper has its only excuse in its attempt to elucidate a few of the points in which differences of opinion have arisen and an attempt to clearly present the diagnosis and treatment of these affections as they are practiced at the present time.

While the antrum of Highmore is generally the largest of the sinuses, there are a number of anomalous conditions in which the antrum is very small and again in which the antrum encroaches so far up that its upper border reaches the floor of the orbit. The antrum of Highmore exists as such in foetal life although one observer maintains that it is not present until the fourth year of life.

As a general rule the antrum is one large cavity, but occasionally it is divided by septa reaching often to the upper wall of the antrum. These septa are usually very thin and readily broken down, but occasionally the bony wall that forms them is hard as adamant. The principal diseased condition of the antra are inflammatory and may be those of simple inflammation, conditions of serous exudate, of pus, and of all grades of degeneration of the mucous membrane.

ETIOLOGY.

Among the principal causes of diseased antra are, infection having as its origin an acute form of influenza, infection from neighboring inflammation and infectious conditions such as diphtheria, scarlet fever, etc.; extensions of purulent conditions from the alveoli; external injuries and constitutional disease.

While there are no reliable statistics on the subject it occurs more frequently in males, and by far the greater number are adults. Its occurrence in children is so rare that in an article on empyema of the

* Membership Thesis.

antrum in young children I was able to gather but ten cases altogether, of which mine was one, in the world's literature.

In fact so infrequent is the occurrence of this affection in young children that one writer attempted to prove that there was no antrum in early life and said that these diseased conditions were simply caries.

The symptoms in the acute cases are mainly those of pain directly over the antrum extending sometimes to the frontal region; this pain is of a persistent gnawing character, is constant and at times exceedingly severe. Unless relief is obtained a muco-purulent discharge appears on the same side without, as a rule, relieving the pain. There is no periodicity to the pains although there are times when there is a cessation which is soon followed by recurrence of the pain.

Another class of case gives a history of some form of acute rhinitis followed by a muco-purulent discharge; the discharge is on the side affected but it must be borne in mind that both antra may be simultaneously affected.

Diagnosis. In the case where the history is apparent and the symptoms clearly presented, the diagnosis is very easy. In the more chronic conditions however, the diagnosis is by no means easy and sometimes a rare degree of diagnostic skill is required, every means at our command being requisite to reach the desired end. In a suspected case of antrum disease the nose is first examined and if, as is very apt to exist, the nasal mucosa are swollen, an application of a solution of cocaine becomes necessary.

After a wait of a very few minutes the interior of the nose can be inspected and search is made for the presence of pus. A single drop of pus may be found hanging from the under surface of the middle turbinate, and this is the first clew. The patient is then directed to bend the body forward and the head downwards for a few seconds and then sit upright and pus will often be found at the site of the original drop.

At times, however, there is no evidence of pus. In such a suspected case, finding the interior of the nose normal, palpation over the external surface of the antrum with the index finger or thumb in the patient's mouth may elicit pain.

Trans-illumination in a fully darkened room may show a distinct area of darkness. This latter method is the most uncertain of all our methods and while it may be corroborative it is by no means a final or decisive test.

All the examinations made hitherto may still be negative and here the instruments devised by Hajek or preferably a much stronger one

devised by Abraham of New York City comes in use. The instruments mentioned are a trocarcanula which is placed in the floor of the nose about an inch from the external meatus and plunged through the nasal wall of the antrum into the cavity with a syringe attachment for aspiration. The contents of the antrum are thus ascertained. The writer has made a number of investigations with the fluoroscope in the hope that the X-Ray might help in diagnosing diseased conditions in the bone cavity. Thus far nothing tangible has presented as a result.

Treatment. For acute disease of the antrum, nothing is so valuable as the washing out of the antrum through the natural opening.

Some misunderstanding has arisen regarding statements made by myself in reference to the possibility of cleansing the antrum of Highmore through the natural opening.

If we bear in mind the position usually maintained by the patient in an upright posture and at the same time the position of the antrum, we will note that the floor of the antrum is on a line normally with the ala of the nose. The natural opening, however, lies directly under the middle turbinate and enters into the antrum in its upper portion.

It stands to reason, therefore, that drainage through this opening would only affect such portions of the cavity as lie above the opening and hence the statement made that given copious pus discharge from the antrum of Highmore, drainage through the natural openings becomes impossible and that irrigation alone cannot be of lasting benefit. In acute cases, however, thick pus has not formed and the cleansing may be done through the natural opening.

It is all important that washing out of the cavity should be with a steady stream and a copious supply of fluid.

A solution of $\frac{1}{2}$ of 1% Lysol has acted best in my hands and I have been able to irrigate freely, keeping a constant control on the pressure required, alternating or following the irrigation as the case may be by forcing air through the same tube that is used for washing purposes.

This has been done by the use of a very ingenious device originated by Dr. S. Yankauer of New York City, my assistant at the New York Eye and Ear Infirmary. The wash bottle is placed alongside the patient and when the tube has been introduced in the natural opening the simple turning of a cock is all that is required.

The apparatus which I presented before the section on Laryngology of the New York Academy of Medicine is thus described. (Fig. 1.)

The apparatus consists of a bottle having a metal cap which carries a pressure gauge, and inlet and an outlet tube. The inlet tube fits the cut-off of the compressed air outfit and is closed by a stop-cock. The outflow tube reaches to the bottom of the bottle and has a two-way stop-cock, to close the tube and to change its contents from fluid to air. The latter is used to empty and dry the sinus after irrigation.

The bottle, which holds one quart, is filled with a pint or less of fluid, and compressed air let in until the gauge registers 20 pounds. The in-let stop-cock is closed and the apparatus disconnected. The strength of the stream can be regulated by the stop-cock at the out-

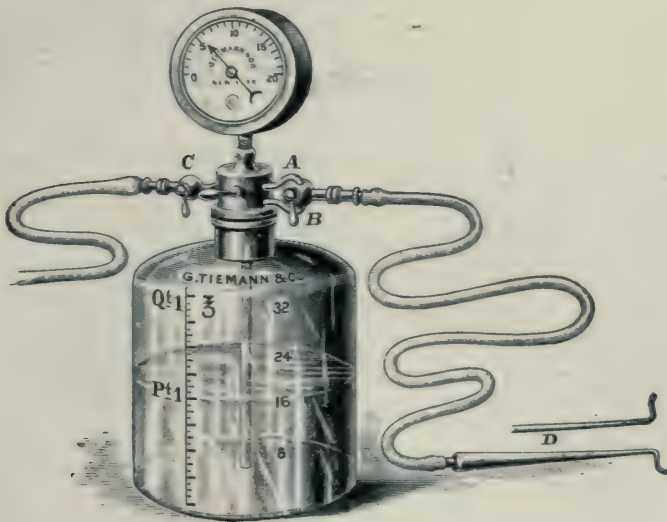


Fig. No. 1.

flow tube. As the pressure actually used at the extremity of the canula is less than 5 pounds, the bottle will empty itself with a practically constant flow.

If a larger quantity of fluid is to be used, the cut-off is attached to the inlet tube, the cut-off and stop-cock left open, and the pressure adjusted by means of the regulator of the compressed air outfit.

By means of this apparatus the pressure used to irrigate each accessory cavity can be measured. The strength of the stream can be varied from a mere dripping to a powerful jet, and it is always under absolute and immediate control.

To irrigate the antrum, Messrs. Tiemann & Company have made for me two virgin silver tubes which taper towards the distal end. The proximal end is fitted with a round extremity and grooved thus enabling the rubber tubing to fit snugly.

The distal end has a double curve which may be likened to the double curved needles used in cleft palate operations and are so curved as to be useful for the right or left antrum. This bending is readily done as the material is malleable but on account of the danger of breaking from much bending I prefer to have two tubes already bent, one for each antrum.

A small amount of cocaine renders the nose less susceptible to irritation and the introduction of the tube is thereby facilitated.

The orifice being directly under the middle turbinate the tube must be well introduced to that bone before the opening is sought. When so introduced the tip of the tube enters readily into the opening, which fact may be ascertained by its being hooked in and self retaining.

All air is first expelled from the tubing and canula before the introduction into the cavity. The fluid is then turned on, the patient having a pus basin to catch the flow. If not too much pressure is exerted a pint of fluid can be used readily at a time for irrigation.

The irrigation is continued as many times as may be necessary until the fluid returns clear; then air is forced into the cavity. The temperature of the fluid used is about 90 degrees Fahrenheit. Sometimes a single washing is sufficient to relieve all symptoms of acute disease of the antrum and again repeated washings may become necessary. Very frequently the middle turbinate, really a large ethmoid cell, is much distended and encroaches on the septum. The indications are for its prompt removal and the scissors presented by Holmes of Cincinnati are of great value for this purpose.

The removal of the middle turbinate establishes a free drain at the natural orifice and this alone is often followed by amelioration of all symptoms to a marked degree. We are also enabled to irrigate more readily when this has been done. For the more chronic conditions irrigation is a slow and tedious process and something of a radical nature becomes necessary. Intra-nasally the wall of the antra may be broken down by the use of the electro-trephine with the burr directed downward and outward beneath the middle turbinate or upward and outward on a line with the inferior. The radical mode of procedure, however, consists in operating through the canine fossa. The complete operation is known as the Caldwell-Luc operation and consists of opening the canine fossa and then breaking

down the nasal wall making through drainage. Another operation is the opening of the canine fossa and inserting a rubber tube for drainage. Still another form is the extraction of a tooth and extension of the cavity of the alveolus into the antrum.

The modes of operation are so well known that I shall not detail them here. I may, however, call attention to a device for the retraction of the cheek which I have found very useful in operating and subsequent dressing. (Fig. 2.) It is shaped like a perineal retractor and its long handle enables the patient to keep the cheek well retracted in the subsequent dressings or in operating when held by an assistant. (See accompanying illustration.)

That the diagnosis of disease of the antrum of Highmore is not always easy of accomplishment is evidenced by the brief history of three cases here presented.

In all of these cases the patients had consulted competent rhinologists—one of them indeed had traveled to the principal European cities in the hope of obtaining relief.



Fig. No. 2.

In none of them was the diagnosis of antrum disease made, until made by myself, and all recovered promptly after operation.

Case I. Male, aged 55, referred to me by a neurologist whom he had consulted after having been treated for many weeks for neuralgia. The neurologist suspected antrum disease which I promptly confirmed. Operation the next day through the canine fossa, discharge of muco pus, prompt cessation of pain, wound closed in one month, no recurrence.

Case II. Female, aged 40, severe facial pains lasting for three years in which time she consulted prominent physicians in this country and Germany. By the advice of her family physician, she consulted the neurologist who had referred case No. 1 to me. I was asked to see the case in consultation with both gentlemen. I found much tenderness over the antrum, a distinctly dark spot in transillumination, no pus in the nose, but a fistulous opening above the first incisor through which pus was streaming and had been pouring

all the time. I was able to elicit the fact that when pus flowed freely from this fistulous opening the pains diminished, while when it was closed the pains became unbearable. A very fine probe entered the fistulous opening, curved along the right and touched the bony covering of the antrum on that left side. My diagnosis was suppuration in the antrum of Highmore whose occasional outlet was through this fistulous opening.

This was concurred in by the gentlemen present and the following day, in their presence, under gas and ether anæsthesia, I operated. Portions of the antrum wall were eroded and a free flow of pus followed the opening. The patient made a good recovery from the operation, a drainage tube was subsequently inserted, and two months later the wound was allowed to close. From the time of operation there have been no pains, although five years have elapsed and I have had occasion to see the patient from time to time.

Case III. Female, aged 32, of neurotic temperament was referred to me by her physician whom she had consulted the day previous. Her previous history is interesting from the fact that she had been suffering from severe facial pain for over two years and had been treated by her physician in the southwestern part of this country. She had gone to Sanitaria with only temporary benefit. She had consulted a distinguished rhinologist in Chicago and the eventual diagnosis in each case was that she was malingering. The result of all this were strained relations at home and much unhappiness, the patient making many brave efforts to appear well, but always eventually compelled to yield to her sufferings. An examination led to the diagnosis of disease of the antrum of Highmore, based on the following conditions:

Tenderness on pressure over the left antrum most markedly acute about its center. A dark spot showed on trans-illumination. On the following day, under ether anæsthesia and in the presence of her own physician who had accompanied her from her home and of the neurologist who referred her to me and with the assistance of the house staff at the New York Eye and Ear Infirmary I operated in that institution on the left antrum.

The operation was performed by the route of the canine fossa, and as soon as the periosteum was pushed back the exterior surface of the bone over the antrum was found to be carious from above downwards being about 1-16 of an inch in width and fully 1 inch in length. The carious edges were then removed, the antrum washed out and the cavity packed. In one week she left the Infirmary to enter a sanitarium to be treated for her wretched nervous condition.

From this institution she was discharged as cured in due time and there has been no recurrence.

The following conclusions may be reached as a result of the study of these affections.

First. The diagnosis is readily made when all classical symptoms are present.

Second. The absence of pus in the nose does not exclude antral disease.

Third. Pain, long lasting, directly over the antrum should be an added factor in the diagnosis.

Fourth. Trans-illumination test is corroborative.

Fifth. The washing out by means of the natural opening is difficult of accomplishment because of the lack of proper drainage and is applicable to the acute conditions only.

Sixth. Irrigation by means of a properly made wash bottle whose force can be readily controlled is of very great help in the treatment.

THE COLLODIUM DRESSING FOR INTRA-NASAL SURGERY.*

BY CHARLES W. RICHARDSON, M. D., WASHINGTON, D. C.

The control and prevention of the annoying, and at times dangerous, hemorrhage from wound surfaces in intra-nasal surgery has more or less engrossed the attention of the rhinological surgeons. With the introduction of the supra-renal extract and its derivatives a distinct advance has been made along this line, not only in controlling hemorrhage at the time of operation but also in preventing hemorrhage after the operation. Nevertheless, there are very few surgeons who are courageous enough to allow their patients to pass from out of their immediate observation without any other safeguard than the primary use of supra-renal extract. Most operators depend upon tampons of some character, impregnated with various drugs supposed to lessen the tendency to recurrent hemorrhage. These tampons are not only uncomfortable and painful and give rise to a moderate degree of sepsis, but are painful in extraction. The wearing of the tampons also causes a more or less complete arrest of respiration through the cavity operated upon. The various devices used to prevent hemorrhage cause more or less reaction and thereby prolong the process of repair. It has always seemed desirable to me to find some non-irritating substance that could be applied to the wound surface that would through vaso-motor or mechanical means control recurrent hemorrhage and yet allow the nasal chamber to be free. While casting about for some such agent, my attention was attracted by the article by Dr. Kasper Pischal, of San Francisco, on "Collodium after Nose Operation," published in the *Archives of Otology*, Vol. XXXI, No. 5, 1902.

The method suggested by this paper for the prevention of hemorrhage after intra-nasal operations struck me as quite novel and sound in therapeutics. It seemed though to me that it was doubtful if the control could be depended upon; and the method of execution, as suggested, seemed to be cumbersome and difficult. It was some time before I hazarded an attempt to prove or disprove my objection to this method. My first trial proved quite satisfactory—that if the collodium is properly applied to the whole wounded surface it will absolutely control bleeding from the wounded surface. I believe that the method of application suggested by Dr. Pischal admits of improvement, but that is a question of individual preference. I

* Membership Thesis.

have used the collodium dressing in sixty cases, spurs and partial turbinal resections and so far have had no recurrent nasal bleeding. Some patients have a little oozing for several hours after the operation, just enough to color the expectoration. The patients are decidedly more comfortable, sleep thoroughly the first night and feel quite well the second day. The wound heals more rapidly. The method which I adopt in the application of the collodium is as follows: The operative surface, after being thoroughly cocainized and saturated with supra-renal until blanched, is operated upon. After the operation a large piece of absorbent cotton thoroughly saturated with supra-renal is applied over wounded surface and allowed to remain for about fifteen minutes. By the second application all vessels in the deep portion of the wound are brought under the control of the supra-renal. At the end of the time indicated above the supra-renal bearing pledget of cotton is removed and the wound surface, which is now also blanched, is thoroughly wiped dry with pledget of dry cotton. A cotton carrier, which has been wound with a thin layer of cotton, is now quickly dipped into the collodium and as quickly as possible painted over the wounded surface. Several applications are then made of the collodium, rapidity of action being necessary, until quite a film of collodium is formed over the wounded surface. Several blasts of air through the nasal cavity aids in the more rapid evaporation of the ether and the more thorough setting of the collodium. The method suggested by Dr. Pischal for the application of the collodium is through the medium of a dropper. I found this method quite difficult in manipulation and uncertain in reaching all the wounded surface. I have found, in verbal communication with my eastern colleagues, that scant notice seems to have been taken of Dr. Pischal's suggestion, and, as I have seen in the literature no further article upon the subject, either by Dr. Pischal or other writers on rhinology, and as the method is of such practical utility and comfort for the intra-nasal surgeon, I write these few lines to express my appreciation to him for calling it to my attention, to attest to the value of the method in controlling nasal hemorrhage after operative work, and, if possible to extend the knowledge of this treatment of intra-nasal wounds among rhinologists.

SOME IMPROVED NOSE, THROAT AND EAR INSTRUMENTS.

BY EDWIN PYNCHON, M.D., CHICAGO.

In the removal of submerged or semi-submerged tonsils, when for any reason the more radical operation of tonsillectomy by "cautery dissection" cannot be done, as, for example, owing to the length of time required, or the necessary expense of treatment thereby, then, as an alternative, dissection with knives can be practiced, and, while the immediate hemorrhage from this operation is almost invariably greater, the general results are good in the way of removing the cause of both subjective and objective symptoms, even though the cosmetic results may not be so favorable.

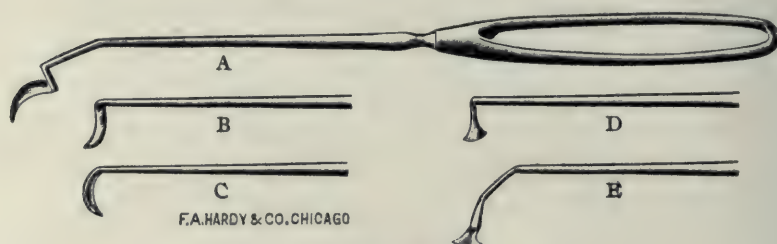


Fig. 1.—Tonsil Knives ($\frac{1}{2}$ size.)

The knife A is used for severing, as a first step, the attachment of the tonsil to the anterior pillar, and can be used on either side. As a second step, the attachment to the posterior pillar is severed, using knife B for the left tonsil and knife C for the right tonsil. As a third step the tonsil is dissected loose from its posterior attachment, using the separators shown, being respectively D for the right tonsil and E for the left tonsil. During these steps, the patient is to hold down his own tongue with a suitable tongue depressor, while the tonsil is being pulled outward toward the median line by the operator with a good tonsil forceps. Personally I use the ones I employ in cautery dissection. These knives are intended for use by a right-handed operator. After the use of the knives, as already described, the tonsil being operated is still attached at the bottom, but is quickly removed by the use of a cold snare.

This snare is a modification of the Sloane snare in which several changes have been made. In the Sloane snare the distal opening of the canula is flattened so as to constitute a slit, whereby the direction of the loop is better guided and controlled. In order to not destroy this valuable feature, and still permit of the use of a bodkin (commonly called stylet by surgical instrument dealers), whereby a short wire loop can be employed, I have had made on one side of this flattened end of the canula a triangular opening and a transverse groove. In this way these two valuable features can be combined. The ecraseur nut has been much increased in size and provided with

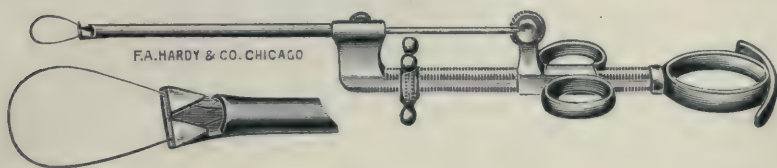


Fig. 2.—Tonsil snare ($\frac{1}{2}$ size.)

projecting points to facilitate easy operation. By being provided with a more delicate canula and bodkin this snare would also do for nasal work. In tonsil work I use a No. 7 steel piano wire.

This tonsil tenaculum I occasionally employ when the forceps have not taken a good hold. Tortion for the control of tonsillar hemorrhage has been advised by different writers. The shank of this tenaculum has been flattened so after tortion has been applied the desired position can be retained by the patient closing his teeth.

In order to control a hemorrhage during tonsillotomy this instrument can be used, and with it a strong and steady pressure can be



Fig. 3.—Tonsil Tenaculum ($\frac{3}{5}$ size.)

applied for a short time, which is often sufficient. Before use the distal button should be covered with a few thicknesses of gauze fastened by a string about the shank. If desired, the gauze can be reinforced with a little cotton, so as to better absorb any astringent remedy with which it is moistened. Monsel's solution, or a 90-grain solution of the nitrate of silver, are the best to use.

In cases where hemorrhage after a tonsil operation is severe, or where pressure for a prolonged time is desired, this device is preferable to the tonsil presser last described. This instrument is of horse-

shoe shape, and is so thin at the point where it emerges from the mouth that the teeth and lips can be quite tightly closed, which adds to the convenience of its use. The inner end is provided with the usual hard wood button, and also with an oval cup, which latter I prefer. Before applying this instrument, the cup is first filled with cotton, secured by a thread passing through an opening at the bottom of the cup, and medicated with such astringent as desired. At the external end is a metal pad with screw adjustment. The metal

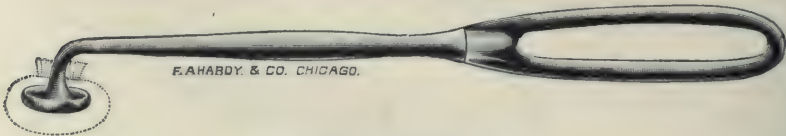


Fig. 4.—Tonsil presser ($\frac{1}{2}$ size.)

pad is not upholstered as is the common custom, for the simple reason that such upholstering is not so good as the several thicknesses of a properly folded towel. By operating the screw pressure is exerted below the angle of the jaw. If the screw in any case does not seem to be long enough, the deficiency can be easily supplied by the use of an additional towel as a pad. This hemostat is equally applicable to either side, and when applied can be so covered by a folded towel wrapped about the chin that the patient can, without

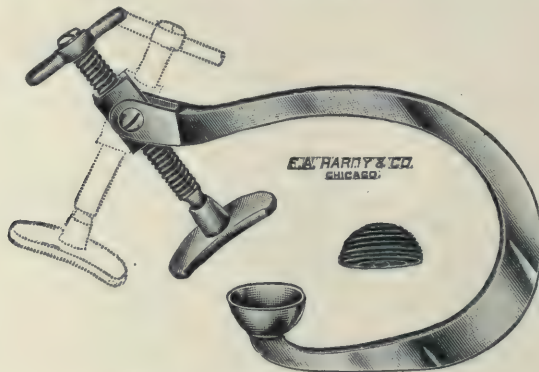


Fig. 5.—Tonsil Hemostat ($\frac{1}{2}$ size.)

attracting attention, take such street car or other ride as may be required in order to go from the office to his home.

When adenoids in early life are not removed, an atrophic degeneration may follow, which is not infrequently observed in adults, and is, when present, a source of annoyance which should be removed. For these cases the ordinary adenoid curettes are of but little

value. The curette shown consists of a small ring knife with cutting edges at either side. In its use, after cocaine anesthesia, the curettement of the pharyngeal arch is done by scraping both upward and forward, as well as downward and backward, from the point of greatest depression. Two or three such motions are required in order to remove all of the soft tissue.

The two features of this instrument are first, the employment of two pins, in addition to the usual terminal roughness, in order to better avoid the possible loss of the cotton, and second, the placing



(Fig. 6.—Naso-Pharyngeal Curette (2/5 size.)

of a groove upon the convex surface so by the use of a small knife blade or shears the cotton can be easily removed after the treatment. The apparent delicacy of this applicator is in accordance with my conviction that but little rigidity is required in such an instrument, which should be so introduced as to avoid obstruction instead of being forced thereby, and the ring end lightly held between the thumb and forefinger while the shaft passes between the middle and ring fingers gives ample control thereof.

The new speculum here shown is not intended as a substitute for the one previously described, and now so generally used, but is de-

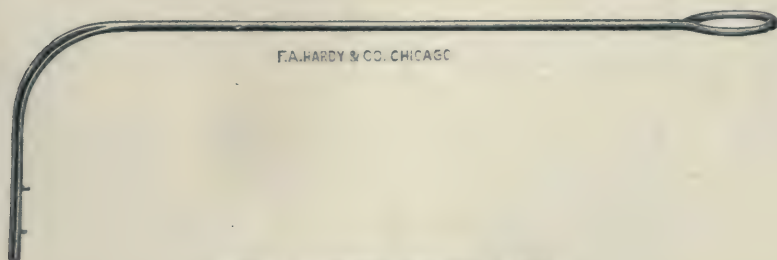


Fig. 7.—Laryngeal Applicator (1/2 size.)

signed for certain special cases and conditions. The blades are made somewhat narrower in order that they may be wider separated when the nasal opening is smaller than usual. The outer horn is to hold up flabby tissue sometimes present about the nasal opening, which hangs down like an awning and obstructs the view when the earlier style of speculum is used in certain cases wherein the ball on one side must be introduced into the vestibule and against the septum.

The set screw is to prevent its being opened beyond a desired point while operating, in case of a very tender nostril, or where a soreness or chap exists as a result of irritation.

After intra-nasal operations, particularly where the bone has been wounded, when hot carbolized douches are to be used, this tip will



Fig. 8.—Special Nasal Speculum ($\frac{1}{5}$ size.)

be found serviceable. Its oval shape permits of easy introduction, and its carrying capacity approximates the so-called “rapid flow” tips.

This snare is both light and powerful. The tip is so delicate that when strung on either end of the wire, after the wire has been intro-



F.A. HARDY & CO. CHICAGO
Fig. 9.—Nasal Irrigation Tip (full size.)

duced, it can be used to guide or change the position thereof. The form of binding posts employed permits of ease in fastening or unfastening the wire, and they are so arranged that both ends of the loop can be simultaneously pulled in the usual manner, or, if desired, when a particularly tough pedicle is encountered, one end of



Fig. 10.—Fibroid Snare ($\frac{2}{5}$ size.)

the wire can be fastened to the stationary post, while all of the traction is applied to the opposite end thereof, and thus secure a sort of sawing constriction.

This snare is of sufficient size to be easily grasped by the operator's hand, and of convenient form for easy manipulation. It is provided

with two canulæ, one being of steel and containing two parallel holes whereby the wire is prevented from twisting, and so the loop can be guided with greater accuracy. This valuable idea is borrowed from Dr. H. B. Young of Burlington, Iowa. The other canula is of virgin silver, so it can be bent as desired, in order to conform

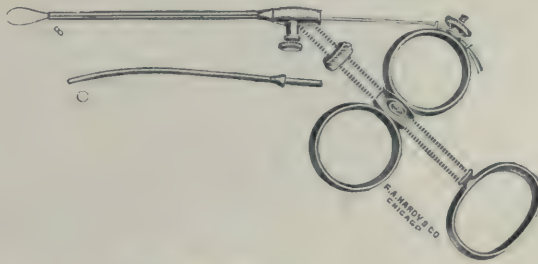


Fig. 11.—Aural Snare ($\frac{1}{2}$ size.)

to the course of a crooked external auditory canal. The wire ends are fastened by screw pressure instead of by twisting about a post. The adjusting nut is not for tightening the loop, but to hold it where set, so it can not be unconsciously made larger.

The Siegle pneumatic speculum (often incorrectly called an otoscope) has for years been to the otologists one of the most valuable

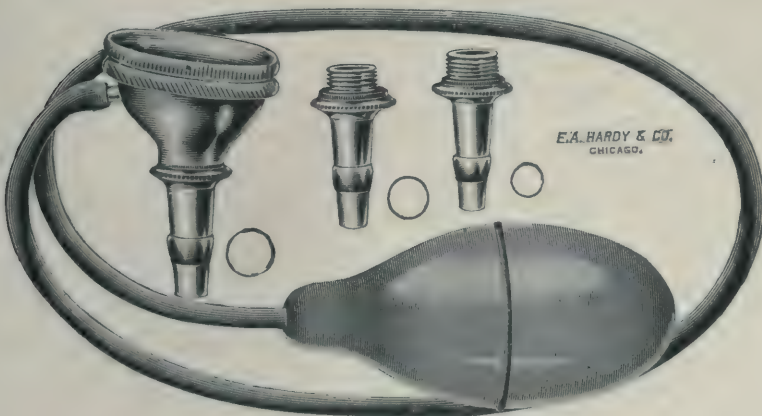


Fig. 12.—Pneumatic Speculum ($\frac{1}{2}$ size.)

diagnostic instruments, though as usually made, with the simple conical ear piece, it often can not be used with satisfaction. Dr. Burnett appreciated this fact, and in order to make it more surely fit air tight in the canal opening he had placed at the end of the ear tube an abruptly conical enlargement. While this is thoroughly ef-

ficient for the purpose specified, a sufficient view of the drum-head is often prevented by the canal being of too small size, or when deviating too much from a straight line. My improvement consists in moving this enlargement of Burnett part way up the ear piece, so it, as well as the entire point, can be covered by a short piece of rubber tubing. In this way the swelling makes it air tight, while the point is far enough introduced to get near to the bend in the canal, and thus furnish an unobstructed view. This feature has been incorporated in a metallic speculum on the market, though an extra milled ring has been applied about the outer end, so as to give a better holding surface. The glass is of correct magnifying power so as to about double the field being inspected. In order to get the best results when using the pneumatic speculum, and prevent the condensation of vapor upon the glass, it is necessary that the device be first warmed over a gas burner, the bulb meantime being operated a few times, so as to fill the instrument with heated air. Lastly, the rubber covered tip must be slightly moistened.

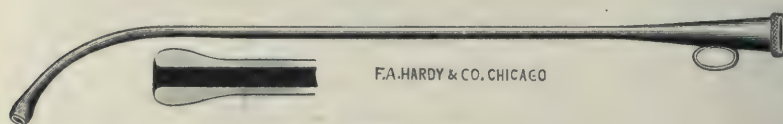


Fig. 13.—Eustachian Catheter ($\frac{4}{5}$ size.)

My preference has always been for the silver catheter with bulbous end. As usually made, the distal opening of the Eustachian catheter has an angular corner, which is even disagreeable when touching the finger, and must of necessity be irritating when touching the delicate mucous membrane about the tubal opening. My improvement consists simply in the reaming out of this opening, so as to efface the angular edge alluded to, or in other words, so the opening will be rounded inwardly, as is the bulbous end rounded outwardly. Latterly, in compliance with the suggestion of Dr. M. A. Goldstein, I have been using catheters materially shorter than those in general use and find them more satisfactory.

These instruments, as described, are being made by the surgical department of F. A. Hardy & Co., of Chicago.

Columbus Memorial Building.

REPORT OF CASES.—EXHIBITION OF INSTRUMENTS.

Mastoid Retractor:

Shown by Dr. A. H. ANDREWS. The mastoid retractor consists of two horizontal bars which are supplied with a row of sharp teeth and united to a cross bar, by means of which any desired space may be maintained. The cross bar is permanently attached to one arm and slides through two slits in the other, so adjusted that when pressure is made upon the teeth the arm becomes firmly locked to the bar. The lock is released by pressure upon the handle close to the cross bar. Each arm has five teeth and is provided with an extension bar carrying four additional teeth. The extension may be so applied as to increase the length of the bar by 2, 3, 4 or 5 teeth. Quickness of application and simplicity of construction are the principal advantages of this instrument.

A Tongue Depressor:

Shown by Dr. A. H. ANDREWS. The tongue depressor which I desire to show has a narrow blade and short handle with a bend at the bottom of the handle to go around the little finger, so the depressor can be held firmly without gripping it. It is my practice to put the second finger under the chin to hold the head steady and to enable me to make firmer pressure on the tongue. When so used the patient is not likely to resist the tongue depressor. Gagging is caused by fear that the depressor will slip down too far, but this additional point of contact between the hand and the patient's face does away with the feeling of insecurity.

A Gauze Packer:

Shown by Dr. BANE. I wish to show you a simple gauze packer that is made by cutting off the sharp point of an ordinary probe and then serrating it. In 1899 I found trouble in packing mastoid wounds with an ordinary probe. I took a file and serrated the sharp end of the probe, making it into three or four points. When you undertake to carry a piece of gauze down into a sinus with the olive probe point it slips off, and is apt to cause the patient pain; but that does not occur with this instrument. I published an article in the Medical News in 1899 illustrating this packer. Any of you that have any mechanical skill can take a small file and cut off the triangular end of a probe, then serrate it and it will serve as a packer.

Pathological Specimens, Sclerosis of the Mastoid:

Shown by Dr. J. C. BECK. These you will not be able to examine except with the microscope, but I wish to make some remarks on the

practicability of this work. I refer to sclerosis of the mastoid, in regard to which the literature is meagre. Stein, of Chicago, gave the best résumé in a paper at Indianapolis on sclerosis of the mastoid. I had a case of this kind at the time and promised to operate as soon as I could. I operated and removed a portion of the bone from the mastoid process large enough to be decalcified and prepared microscopically with the idea of finding whether the periosteum is involved and whether any nerve fibres were in the bone structure. I stained for nerve structure, but I did not find any. I did succeed, like Stein, in relieving the patient of the pain. I have no explanation to offer. Other suggestive means, though not as strong as this, were not effective. There is a specimen of osteo-sclerosis of the tibia to compare with this pathological condition.

A New Ecraseur and Tonsillotome:

Shown by Dr. W. L. BALLENGER. I wish to show a new ecraseur and tonsillotome. It is designed to replace the tonsil snare. It is very simple in construction, consisting of four parts. The blades are quite similar to those in the ordinary tonsillotome, one being very dull; indeed, it is round like a wire. Another blade has a beveled edge, which renders it a dull-cutting instrument or a sharp-cutting instrument, according to the side placed upwards in the female portion of the ring. A third blade is quite sharp, as in the ordinary tonsillotome.

The instrument possesses all the advantages of the tonsil snare and of the ordinary tonsillotome. No time need be lost in threading with wire. It may be used with the dullest blade just as though it were a sharp-cutting tonsillotome.

The Crabtree Massage Outfit:

Shown by Dr. J. A. DONOVAN. This is the Crabtree massage outfit. It is made to screw on a water tap; the water flowing through this pump causes a vacuum in the cylinder. The vacuum produces suction and raises the piston, opening the valve. With it interruptions can be produced over 4000 a minute. The strength of suction can also be regulated, making a very convenient and economic instrument for the patient's use. By screwing down the valve, it can be used for aspirating and with proper attachments would serve many useful purposes.

A Hot Air Applicator:

Shown by Dr. LARGE. I have a little instrument here for applying hot air. It is very inexpensive, costing about two dollars. As you will see, it is a small piece of carbon in a cylinder connected to a speculum through which there are two tubes running, one conveying the

hot air to the ear drum and the other returning the cold air. I use it in acute conditions only, as I do not think it has any beneficial results in chronic catarrhal otitis media.

Three Cases of Disease of Vocal Bands:

Shown by Dr. LEVY. *Case I.* This patient has been under my observation since 1891, at that time coming with marked ulcerations, aphonia and general breaking down. He has been cured for twelve years, has a good voice and has been employed in business without trouble since.

Case II. This patient had ulcerations on the vocal bands and aphonia and has been cured for six years. You can see the scar tissue. He had hemorrhages three years ago and a return of the aphonia, which was due to paralysis of the left vocal band from pressure of enlarged glands, which occurs every now and then in these tubercular cases. He has complete restoration of voice through absorption.

Case III. In this case, there was extensive infiltration seven years ago with complete aphonia lasting 18 months, and after nine months' treatment and residence here he began to have a voice, which is now good. There was extensive infiltration without ulceration.

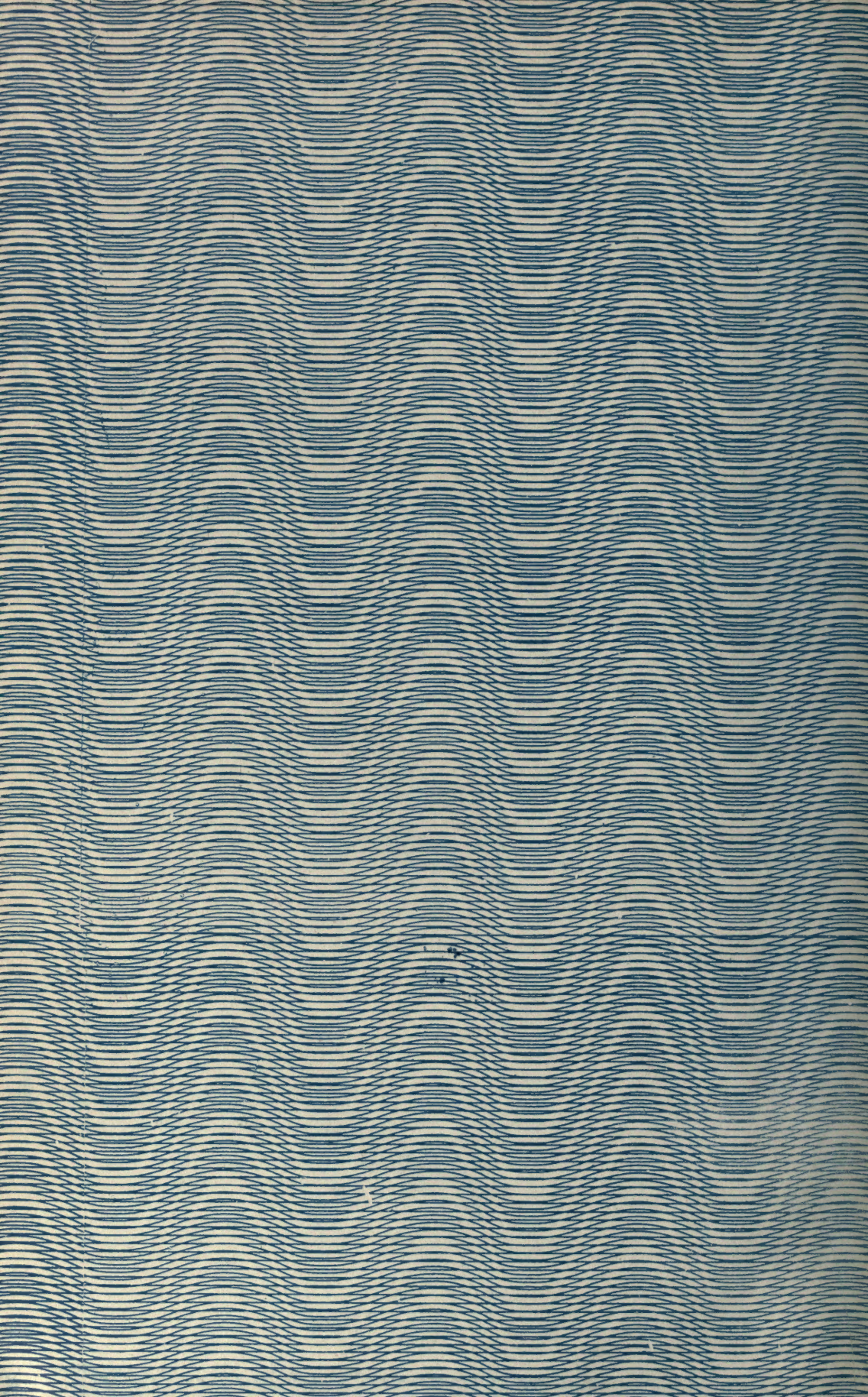
Case IV. This case is not tubercular, although the vocal bands are adherent in the anterior third. The patient was operated on many years ago by Schroetter, of Vienna. It is a rather rare condition, being one of adhesions of the vocal bands of indeterminable cause.

Apparatus for Packing External Auditory Canal at Home; and a Combination Ear and Nasal Speculum, Tongue Depressor Laryngeal and Post Nasal Mirror; and an Attic Syringe:

Shown by Dr. JOSEPH BECK (Chicago). On writing an article on the home treatment of suppurative ear disease, I described such a probe as this, but I did not know of Dr. Bane's probe. I gave the credit to Dr. Pierce. The apparatus for ear packing consists of this spiral shaped glass tube, filled with very narrow strips of gauze and covered by a rubber cup and this flexible probe of Bane. It has served me well in cases where I could not pack the ear myself every day, and still I knew it ought to be done every day.

This combination instrument I have used for two years. It consists of ear and nasal speculum, tongue depressor, laryngeal and post-nasal mirror; it can be boiled and is so small as to be easily carried in your pocket.

An attic syringe as well as a cannula for washing out tonsillar crypts or injecting fluids into the middle ear.



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